



SYSTEMATIC REVIEW: The impact of compassion-focussed interventions on shame and self-criticism in people with mental health difficulties. A review of the literature.

EMPIRICAL PAPER: The effect of self-compassion on negative self-referential processing and its psychophysiological correlates following a social evaluative stress.

Submitted by **Lewis Pettit**, to the University of Exeter
as a thesis for the degree of **Doctor of Clinical Psychology**, May 2nd 2017

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature:

A handwritten signature in blue ink, appearing to read "Lewis Pettit", written over a light blue horizontal line.

Author's declaration

The systematic review was completed independently by the author. With respect to the empirical study, Undergraduate students Rebecca Jones, Rachel Hedges, Amy Marsden, and Laura Blundell conducted a pilot study (n= 58) to develop and validate a new measure for the current research. The project entitled: "Can a self-referential ('me/not') task assess self-compassion as well as the established Self-Compassion Scale?" utilised a self-referential paradigm to investigate implicit responses to compassion. This study is referenced within the empirical paper. In addition, Masters student Beth Camp assisted in the analysis of the psychophysiology data. Of the 56 participants recruited, Beth completed pre-processing analyses for 28 participants. All other aspects of the study were completed by the author including ethics applications, recruitment, data entry, analysis, and write up.

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School of Psychology

Doctorate in Clinical Psychology

Systematic Review

**The impact of compassion-focussed interventions on shame and self-criticism
in people with mental health difficulties. A review of the literature.**

Trainee Name: **Lewis Pettit**

Primary Research Supervisor: **Dr. Anke Karl**

Senior Lecturer in Clinical Psychology

University of Exeter

Secondary Research Supervisor: **Prof. Ed Watkins**

Professor of Experimental and Clinical Psychology

University of Exeter

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Abstract

Shame and self-criticism are pathological processes associated with several mental health conditions. Compassion-focused interventions have been developed to target these processes, however there has yet to be a systematic review of their efficacy in this regard. A systematic search of the empirical literature on compassion and shame and self-criticism was conducted yielding thirteen eligible studies for review. Due to heterogeneity in study design and sample size, a narrative synthesis approach was employed to explore (a) the impact of compassion-focused interventions on shame and self-criticism, and (b) the relationship between changes in shame and/or self-criticism and psychopathology. There was considerable heterogeneity in the findings and a lack of controlled studies. Most studies presented evidence to suggest that compassion-focussed interventions can reduce self-reported levels of shame, self-criticism, and psychopathology, however, the majority suffered from methodological short-comings. Studies with more rigorous designs reported less evidence for the efficacy of compassion-focused approaches. Thus, the current review provides preliminary evidence for the efficacy of compassion-focused interventions to attenuate shame and self-criticism. Future studies with well controlled designs are needed to develop the evidence base, and investigate the relationships between compassion and changes in shame, self-criticism, and psychopathology.

Keywords: Compassion, mental health, depression, anxiety, stress, systematic review.

Introduction

Shame and self-criticism are transdiagnostic processes associated with impaired mental health. Shame is derived from negative evaluations by others (external shame), or how the individual perceives themselves in the minds of others (internal shame), in response to threatening social interactions such as anger, contempt, or rejection (Gilbert & Proctor, 2006). Highly related to shame, especially *internal* shame, is the concept of self-criticism which can be defined as persistent negative self-evaluations that elicit feelings of low self-worth (Falconer, King & Brewin, 2015). Individuals with high levels of shame are more vulnerable to depressive rumination (Cheung, Gilbert & Irons, 2004), whereas low levels of shame predict better recovery from abuse and trauma (Feiring, Taska & Lewis, 2000). Moreover, shame and self-criticism have been implicated as key processes underpinning several mental health conditions including depression, post-traumatic stress disorder, social anxiety disorder, psychosis, and personality disorders (Cox et al., 2000; Gilbert & Procter, 2006; Harman & Lee, 2010; Braehler et al., 2013; Kopala-Sibley, Zuroff, Russell & Moskowitz, 2014).

By contrast, the construct of compassion has been associated with psychological health and wellbeing (Neff, Kirkpatrick & Rude, 2007). Compassion is recognised as an important element in many areas of society, however it affords many definitions. In line with a recent evaluation of the literature, the current review refers to compassion as a cognitive, affective, and behavioural process that can be directed towards the self or others and involves the following components: 1) recognising suffering; 2) understanding the commonality of suffering in human experience; 3) empathy for the person suffering; 4) tolerating uncomfortable feelings; and 5) motivation to alleviate suffering (Strauss et al., 2016). Individual differences in

compassion have been associated with varying levels of psychological wellbeing. Correlational studies have demonstrated that individuals with high dispositional trait-level compassion exhibit greater emotion regulation (Keltner, Kogan, Piff, & Saturn, 2014), interpersonal relationships (Crocker & Canevello, 2012), wellbeing (Neff et al., 2007), and decreased psychiatric symptoms (Schanche, Stiles, McCullough, Svartberg & Nielsen, 2011). Concordantly, a recent meta-analysis demonstrated large effect sizes for the negative relationships between trait compassion and depression, anxiety, and stress (MacBeth & Gumley, 2012).

Other lines of research suggest that individuals can develop compassion through direct approaches such as Compassion Cultivation Training (Jazeraieri et al., 2013), compassion-based meditations (Lutz, Brefczynski-Lewis, Johnstone & Davidson, 2008; Fredrickson, Cohn, Coffey, Pek & Finkel, 2008), and Compassionate Mind Training (Gilbert, 2009), as well as indirect approaches such as Mindfulness Based Cognitive Therapy (Kuyken et al., 2010). Indeed, there now exists an increasing body of evidence to show that compassion-focused interventions can increase wellbeing and reduce psychopathology in clinical and non-clinical populations (see Leaviss & Uttley, 2015 for review), with a recent meta-analysis reporting moderate effect sizes for multiple outcome measures including compassion, mindfulness, depression, anxiety, distress, and happiness (Kirby, Tellegen & Steindl, 2015).

Some theorists have proposed a relationship between shame, self-criticism, and compassion that is underpinned by biological and evolutionary models of human development. Gilbert (2009, 2014) suggests that mammals developed three affective systems that motivate behaviour; the threat system, the drive system, and the soothing system. Whereas the threat and drive systems are crucial in monitoring the

environment for potential dangers and motivating reward and resource based behaviours, it is the soothing system that facilitates social attachments and feelings of contentment and affiliation. In humans, shame and self-criticism can stimulate the threat system and associated physiological changes in sympathetic arousal, the hypothalamic-pituitary-adrenal axis, and cortisol release (Depue & Morrone-Strupinsky, 2005; Porges, 2007). By contrast, experimental studies have shown that compassion can attenuate biological responses to stress; compassion-focused interventions have been shown to increase parasympathetic markers such heart-rate variability, and reduce cortisol levels (Rockliff, Gilbert, McEwan, Lightman, & Glover, 2008; Hofmann, Grossman & Hinton, 2011; Kirschner, 2016). Thus, it is hypothesised that cultivating compassion can redress the balance between the threat and soothing systems by reducing perceived threat, improving emotion regulation and enhancing adaptive coping (Neff, 2003; Gilbert, 2009).

Tentative evidence for this model has been provided by cohort studies showing reductions in self-reported shame and self-criticism following compassionate-mind training in individuals with mental health disorders (Gilbert & Procter, 2006; Laithwaite et al., 2009; Judge, Cleghorn, McEwan & Gilbert, 2012). However, it has been noted that individuals with high self-criticism may find it difficult to develop compassion for themselves (Gilbert, McEwan, Matos & Ravis, 2011). Indeed, individual differences in self-criticism have been shown to moderate psychophysiological responses to self-compassion meditations in healthy volunteer and clinical populations (Kirschner, 2016). Moreover, many of the interventions evaluated in the literature have utilised non-clinical samples (Leaviss & Uttley, 2015; Kirby, 2016), and relatively few have explicitly measured the impact of such interventions on shame and self-criticism. As such, there is a paucity of studies

investigating the utility of compassion-focused interventions to reduce shame and self-criticism in clinical populations, and the existing evidence has not been systematically reviewed.

Aims and objectives

The current review aims to address the following questions: 1) whether compassion-focussed interventions reduce shame and/or self-criticism in clinical populations, and 2) whether changes in shame and self-criticism are related to changes in psychopathology and psychological functioning.

Methodology

To ensure the quality and transparency of the current review, the Preferred Items for Systematic Review and Meta-Analysis (PRISMA; Moher, Liberati, Tetzlaff, Altman, & Prisma Group; 2009) were employed where relevant. See Appendix A.

Eligibility criteria

Given the above research questions, eligibility criteria for the current review focussed on studies which incorporated:

- 1) an active compassion-focused training or intervention component.
- 2) explicit measurements of shame and/or self-criticism.
- 3) a clinical population.

As such, eligibility criteria were defined as follows: *Population*: participants with a diagnosis of a psychological or psychiatric disorder¹, and/or participants who

¹ International Classification of Diseases, 10th Edition (ICD-10; WHO, 2010) or Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV, APA, 2000) criteria.

were engaged in mental health services at the time of the study. Studies only investigating healthy volunteers were excluded; *Intervention*: studies delivering specific interventions or training in compassion focused approaches were included (see Appendix B for summary of interventions). Correlational studies of compassion and mental health outcomes were excluded, as well as those investigating mindfulness based approaches not explicitly aiming to cultivate compassion; *Comparators*: studies with any type of comparison group were eligible for the review. However, due to the scarcity of eligible studies, the inclusion of a comparison group was not a specific eligibility criterion; *Outcomes*: studies incorporating a measurement of either shame and/or self-criticism were eligible for the review. Secondary outcome measures of interest were psychiatric symptoms, compassion, and other measures of psychopathology or functioning; *Study design*: studies were included if they incorporated an active intervention or training component. This included randomised control trials (RCTs), experimental designs, cohort designs (the same participants are assessed pre-and-post intervention), and case studies.

Information sources

Potential studies for the review were identified by searching the following electronic databases of peer-reviewed published journals: Web of Science Core Collection (1900 - 2017); PsycINFO (1806 – 2017); PsycARTICLES (full text), EMBASE (1974 – 2017); and Ovid MEDLINE (1946 – 2017). All searches included the full range of coverage dates and were carried out before February 2017.

Search and selection strategy

Search terms for the review focussed on the intervention of interest (compassion) as well as specific outcomes of interest (self-criticism and/or shame). Initial identification of potential studies was achieved by entering Boolean search terms and relevant synonyms for each research topic area as individual search queries. Combination terms for the returned data were then created so that studies containing compassion terms AND self-criticism terms, OR compassion terms AND shame terms were identified. The procedure for the PsycINFO, PsycARTICLES, EMBASE, and Ovid MEDLINE database searches is shown in Table 1.

Table 1.

Database search query procedure.

Search	Boolean terms	Search Limits	Studies <i>n</i>
1	(compassio* OR self-compassio*).	Title, Abstract	22949
2	(self-critic* OR self-attack* OR self-hat* OR self-reproach* OR self-depreciat*).	Title, Abstract	4959
3	shame*.	Title, Abstract	18797
4	Combine data from search queries 1 AND 2	Title, Abstract	282
5	Combine data from search queries 1 AND 3	Title, Abstract	417
6	Combine data from search queries 4 OR 5	Title, Abstract	614
7	Remove duplicates from search query 6	N/A	409

The same procedure was replicated to identify potential studies from the Web of Science database (search limits were “Topic” in this case). Only peer-reviewed

journal articles in English were selected for screening. Titles and abstracts of studies returned from each database were manually screened to ensure they met eligibility criteria in terms of population, intervention, and study design. Full manuscripts were retrieved for the remaining studies which were further assessed against all eligibility criteria. The bibliography of each eligible study was reviewed for further relevant citations.

Data collection and risk of bias assessment

Data for eligibility criteria and the main findings of each study were extracted from the full manuscripts and tabulated. Effect sizes and reliable change indices were retrospectively calculated where data was available. For RCT, experimental, cohort, and case series designs, risk of bias was assessed using the Quality Assessment Tool for Quantitative Studies (EPHPP, 2009) which has demonstrated content and construct validity and been judged to be suitable for systematic reviews evaluating effectiveness (Deeks et al., 2003; Jackson & Waters, 2005; Armijo-Olivo, Stiles, Hagen, Biondo & Cummings, 2012). The EPHPP assess eight domains: selection bias, study design, confounders, blinding, data collection method, withdrawals/dropouts, intervention integrity, and analyses. Each domain can receive a rating of strong, moderate, or weak. Overall study quality based on the first six domains above and is rated as either *strong* (no weak domains), *moderate* (one weak domain), or *weak* (two or more weak domains), see Appendix C for details.

Data synthesis

A descriptive approach was employed to present the results of the current review due to the heterogeneous nature of the data in terms of study design, sample, intervention, and outcome measures (Tacconelli, 2010). This approach allowed

commonalities and variations to be explored within the data with the aim of identifying patterns and factors that were relevant to the key findings of the review.

Results

Database searches yielded 636 studies. Subsequent screening resulted in the retrieval of 17 potentially eligible full-text manuscripts of which four were excluded. The remaining thirteen studies were included in the systematic review. Figure 1 provides full details of the selection procedure and exclusion criteria.

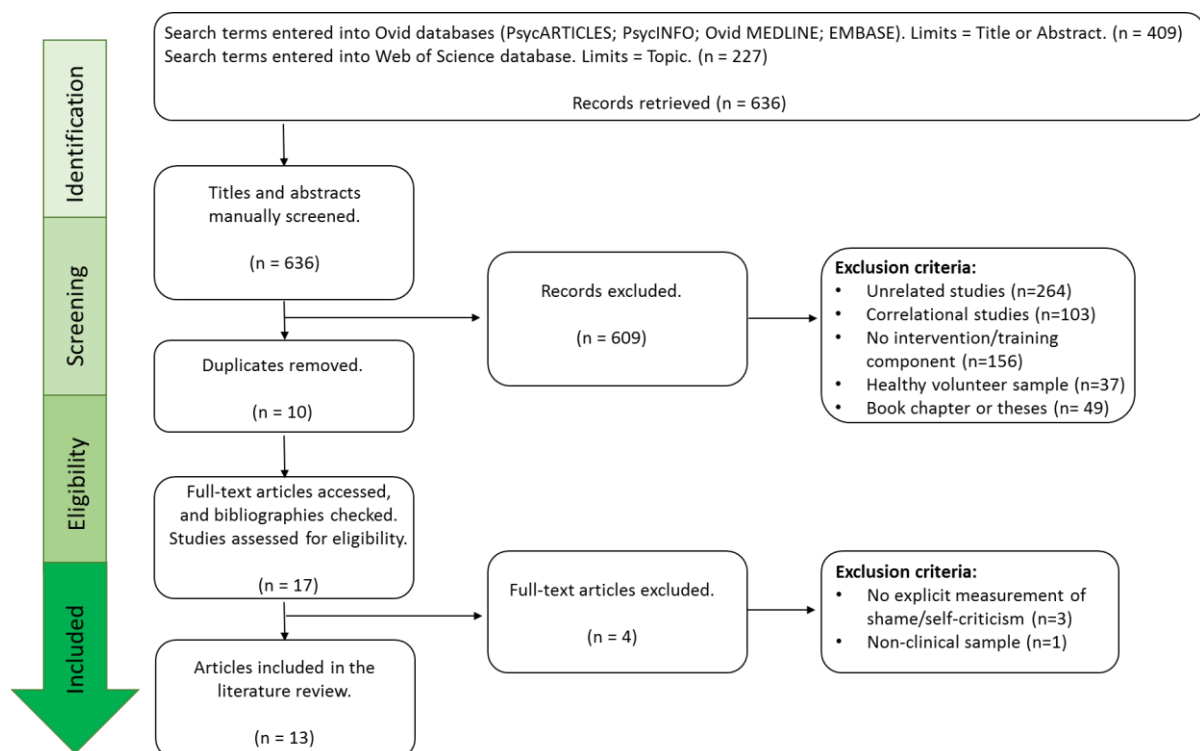


Figure 1. Flow chart of selection procedure for the systematic review.

Study characteristics and design

Study design characteristics, key findings, and quality assessment are presented in Table 2.

Populations: All studies investigated clinical populations in that participants either met diagnostic criteria for ICD-10 or DSM-IV disorders (1,2,3,5,6,8,11,12,13) or were currently involved in mental health services (4,7,9,10). By-in-large, studies in the current review were characterised by small sample size; the largest study comprised 51 participants (3) while the smallest comprised a single-case study (13). Only five had a sample size greater than twenty (1,2,3,4,5).

Interventions: All studies employed interventions with an explicit compassion-focussed component, although there was considerable heterogeneity in terms of the intervention format, intensity, and method of delivery. Most studies employed compassion-focussed therapy or compassionate mind training based on the model proposed by Gilbert & Procter (2006) which was delivered within a group setting (1,4,8,9), individual sessions (11,12), or a combination of both (7). Group interventions were delivered over 12 – 16 sessions and individual interventions were delivered between 8 – 12 sessions. The study incorporating individual and group intervention delivered 24 sessions. Of the remaining studies, two involved compassionate-mind imagery delivered as either a one-off intervention (3) or over four sessions (10), whilst the others embedded a compassion-focussed component within another intervention (2,5,6,13) including trauma-focussed exposure, mindfulness, and psychosis recovery models.

Overall, interventions were well described and provided comprehensive details of compassion-focussed components. Treatment fidelity was not assessed in

any study, however, most studies included specific training in compassion-focused interventions, model specific supervision, or both (1,3,4,7,8,9,10,12). Notable exceptions include those studies in which compassion-focussed components were embedded within other modalities (2,5,6,13), and one study which developed a manualised treatment protocol based on a compassion-focussed self-help book but did not disclose the type of training or supervision received by therapists (11).

Table 2.

Summary of studies included in the systematic review.

Study	Design & Sample Size	Population/Diagnosis	Intervention & Comparators	Outcome Measures	Key Findings	Quality† & Risk of Bias
1. Braehler et al., 2013	Prospective randomised controlled trial; Pre/Post repeated measures. n = 40	Schizophrenia spectrum or bipolar disorder (ICD-10).	Group compassion-focused therapy (16 x 2hr sessions). Therapists trained and supervised in model. Treatment as usual (TAU).	Shame; PBIQ-R Other; CGIS, NRSS, BDI-II, FORSE	Compared to TAU, participants receiving CFT showed greater clinical improvement ($r = -.68$) and had more compassionate narratives on NRSS ($r = .42$). Within CFT group, increased compassion correlated with reductions in PBIQ-R including shame ($r = -.57$), BDI-II depression ($r = -.77$), and FORSE intrusion ($r = -.58$) and fear of relapse ($r = -.52$). Correlations between compassion and social marginalisation/depression were significantly larger in CFT compared to TAU.	Strong† Selective recruitment, no power calculation, TAU arm more depressed at baseline, no group analysis of key outcome measures pre/post-intervention. No intent-to-treat analyses.
2. Feliu-Soler et al., 2016	Randomised pilot study; Pre/Post repeated measures.	Borderline personality disorder (DSM-IV).	Group mindfulness training (10 wks) plus loving kindness (LKM) and compassion meditation (CM) training (3wks).	Self-criticism; FSCRS Other; SCS, BSL-23	No significant pre/post differences between LKM/CM and mindfulness continuation group in FSCRS, SCS, or BSL-23. Significant pre/post reduction in LKM/CM group in	Moderate† No-rater blinding, randomisation procedure not

	n = 32		No model specific training/supervision.		Inadequate ($d = .65$), Hated-Self ($d = .64$) subscales of FSCRS, and BSL-23 ($d = .64$), and increase in SCS ($d = .74, .90$). Significant pre/post reduction in mindfulness continuation group in Inadequate ($d = .52$), Hated-Self ($d = .59$).	described, limited sample size and power, intervention embedded within mindfulness model.
			Mindfulness continuation.			
3. Ascone, Sundag, Schlier & Lincoln, 2016	Experimental design; Pre/Post repeated measures.	Schizophrenia, schizoaffective disorder (ICD-10)	Compassion focussed imagery (single session). Imagery exercise translated for CFT protocol.	Self-criticism; FSCRS. Other; SCS, Paranoia-Check List, SCL.	Compared to neutral imagery, compassion focussed imagery increased feelings of happiness ($d = .73$) and reassurance ($d = .35$) following negative mood induction. No effects on self-criticism, paranoia, self-compassion, or SCL.	Moderate† No eligibility criteria, no rater-blinding.
	n = 51		Neutral imagery			
4. Judge, Cleghorn, McEwan & Gilbert, 2012	Cohort; Pre/Post repeated measures.	Community mental health service (depression, anxiety, OCD, self-harm).	Group compassion focused therapy (12 – 14 wks). Therapists trained in model.	Self-criticism; FSCRS, FSCS Shame; ISS, OAS Other; BDI, BAI, SBS	Significant pre/post reductions in Inadequate ($d = 1.4$), Hated-Self ($d = .90$) and increase in Reassurance ($d = .93$) subscales of FSCRS and Self-Persecution ($d = .45$) on FSCS. Significant pre/post reduction in shame; OAS ($d = .55$), ISS ($d = 1.3$), SBS ($d = .64$), as well as depression ($d = 1.8$) and anxiety ($d = .71$) symptoms. Association between baseline depression/OAS scores and	Moderate† No rater-blinding, 36% of recruited participants did not complete outcome measures.
	n = 27		None			

					change in FSCRS scores post-intervention.	
5. Alliger-Horn, Zimmermann & Schmucker, 2016	Cohort; Pre/Post/Follow-up (3 months) repeated measures. n = 24	Soldiers with post-traumatic stress disorder (DSM-IV).	Imagery re-scripting and reprocessing therapy (IRRT): Imaginal exposure and self-compassionate imagery (18 sessions). Therapists supervised in IRRT model. None	Shame; EIBE Other; PDS, QUI	Significant pre/post reduction in feelings of EIBE shame, maintained at follow-up ($d = 1.8$, $d = 1.6$). Significant pre/post reduction in PTSD symptoms, maintained at follow-up ($d = .98$, $.99$). Pre-intervention guilt/shame predicted change in PDS scores.	Moderate† No rater-blinding, some effect sizes unavailable.
6. Laithwaite et al., 2009	Cohort; Pre/Mid/Post/Follow-up (6 weeks) repeated measures. n = 18	Prisoners with schizophrenia, schizoaffective disorder, or bipolar disorder (ICD-10).	Recovery after Psychosis program. Module two focus on compassion (20 group sessions over 10wks plus individual support). Type of supervision not stated. None	Shame; OAS Other; SCS, BDI-II, RSE, SIP-AD, PANSS	Significant pre/follow-up reduction in OAS shame ($r = .15$) and increase in RSE self-esteem ($r = .47$). Significant pre/post reduction in BDI-II ($r = .38$), maintained at follow-up ($r = .47$). Significant pre/post reduction in PANSS general psychopathology ($r = .38$), maintained at follow-up ($r = .41$).	Moderate† No rater-blinding, intervention was embedded in Recovery from Psychosis program.
7. Ashworth, Clarke, Jones, Jennings & Longworth, 2015	Cohort; Pre/Post/Follow-up (3 months) repeated measures.	Acquired brain injury and anxiety and/or depression (neuropsychiatry outpatients).	Compassionate mind group (6 wks) and individual compassion focused therapy (18 sessions). Therapists trained in model.	Self-criticism; FSCRS Other; HADS.	Significant pre/post reduction in Inadequate ($d = 1.81$), Hated-Self ($d = 1.5$) and increase in Reassurance ($d = 1.38$) subscales of FSCRS. Reduction in depression ($d = 1.43$)	Moderate† No rater-blinding, selective recruitment based on cognition,

	n = 12 (9 follow-up)		None		and anxiety ($d = 1.29$) symptoms. All effects maintained at follow-up.	intervention embedded within wider rehabilitation program.
8. Lucre & Corten, 2013	Cohort; Pre/Post/Follow-up (1-year) repeated measures. n = 8	Personality disorders (ICD-10).	Group compassion focused therapy (16wks). Model specific training and supervision. None	Shame; OAS Self-criticism; FSCRS Other SBS, DASS21, CORE	Significant pre/post reduction in OAS shame, further improved at follow-up. Significant pre/post reduction in FSCRS Hated-Self and increase in Reassurance, both maintained at follow-up. Significant reduction in DASS depression and CORE symptoms (exc. Risk), maintained at follow-up.	Moderate† No exclusion criteria stated, no rater-blinding, effect sizes not reported or calculable.
9. Gilbert & Procter, 2006	Cohort; Pre/Post repeated measures. n = 6	Complex and enduring psychological difficulties (hospital community).	Group compassionate mind training (12 x 2hr sessions). Model developer co-facilitated intervention. None	Self-criticism; FSCRS, FSCS, weekly diary. Shame; OAS, Other; HADS, SBS	Significant pre/post reductions in Inadequate ($d = 2.7$), Hated-Self ($d = 2.0$) and increase in Reassurance ($d = 1.9$) subscales of FSCRS and Self-Persecution ($d = .93$) on FSCS. Significant pre/post reduction in OAS ($d = .82$) and SBS ($d = .87$), as well as depression ($d = 2.2$) and anxiety ($d = 2.3$) symptoms on HADS.	Moderate† Selective recruitment, intervention embedded within therapeutic community setting, no rater-blinding.
10. Gilbert & Irons, 2004	Cohort; Pre/Mid/Post repeated measures.	Depression (community outpatients).	Group compassionate mind imagery and diary keeping (4 sessions over 8 wks).	Self-criticism; qualitative and	Non-significant reduction in self-criticism after 1 week of intervention practice ($d = .39$). Significant increase in ability to generate	Weak† Non-standardised measures of self-

	n = 8		Model developer co-facilitated intervention.	quantitative diary Other; diary (compassio.)	compassionate imagery after 1 week of intervention practice (d = .63).	criticism, data not available post-intervention.
			None			
11. Boersma, Hakanson, Salomonsson & Johansson, 2015	Case series; Multiple Baseline/Weekly/Post/ Follow-up (2-4 week) repeated measures.	Social anxiety (DSM-IV).	Compassionate mind training for social confidence (8 individual sessions). Adapted and manualised treatment model.	Self-criticism; weekly diary questions. Shame; weekly diary questions. Other; SIAS, SPSQ	Some participants showed PEM baseline/post reductions in shame (n=3) and self-criticism (n=2). Social anxiety symptoms reduced in 2 participants (SIAS reliable change index), 3 participants showed clinically significant improvement on SPSQ.	Weak† No rater-blinding, non-standardised measures of shame and self-criticism.
	n = 6		None			
12. Mayhew & Gilbert, 2008	Case series; Pre/Post/Follow-up (6-month) repeated measures.	Schizophrenia (ICD-10) + auditory hallucinations.	Individual compassionate mind training (12 x 1hr sessions). Model developer co-facilitated intervention.	Self-criticism; FSCRS, FSCS Other; BAVQ, SCL-90, VRS, SCS.	Two participants reported significant reductions in Inadequate FSCRS subscale, 2 out of 3 heard more reassuring voices. All showed reduction in SCL-90 symptoms of paranoia and psychoticism. All showed improved BAVQ (total scores reduced, voices became less malevolent and less persecuting).	Weak† No rater-blinding, no statistical analyses of outcome measures (reliable change index calculated retrospectively).
	n = 3		None			
13. Bowyer, Wallis & Lee, 2014	Case study; Pre/Mid/Post repeated measures	Adolescent post-traumatic stress disorder (DSM-IV).	Compassionate mind training combined with trauma-focussed cognitive behaviour therapy (20 sessions).	Shame; OAS Self-criticism; FSCRS Other; PDS, BDI-II	Significant pre/post reductions in Inadequate (24/4), Hated-Self (7/0) and increase in Reassurance (13/29) subscales of FSCRS. Pre/Post reductions in PTSD symptoms from	Moderate† No baseline, reliable change index calculated
	n = 1					

Therapist training and supervision not disclosed.	“severe” to “mild” and depression from “moderate-severe” to “normal”.	retrospectively, intervention embedded within another model.
None		

OCD = obsessive compulsive disorder, ICD-10 = International Classification of Diseases (10th ed.), DSM-IV = Diagnostic and statistical manual of mental disorders (4th ed.), PTSD = Post-Traumatic Stress Disorder. CFT = Compassion Focused Therapy. † = EPHPP global rating, CGIS = Clinical Global Improvement Scale, EIBE = Emotional Distress Inventory-Soldier Version, PDS = Post-traumatic Diagnostic Scale, QUI = Quality of Interaction, FSCRS = Forms of Self-Criticism and Reassurance Scale, SCS = Self-Compassion Scale, SCL = Skin Conductance Level, HADS = Hospital Anxiety and Depression Scale, SAIS = Social Interaction Anxiety Scale, SPSQ = Social Phobia Screening Questionnaire, OAS = Other As Shamer, BDI-II = Beck Depression Inventory (revised), NRSS = Narrative Recovery Style Scale, PBIQ-R = Personal Beliefs about Illness Questionnaire-Revised, FORSE = Fear of Recurrence Scale, BSL-23 = Borderline Symptom List, FSCS = Functions of Self-Criticism Scale, SBS = Submissive Behaviour Scale, ISS = Internalised Shame Scale, BAI = Beck Anxiety Inventory, RSE = Rosenberg Self-Esteem measure, SIP-AD = Self-Image Profile-adult, PANSS = Positive and Negative Syndrome Scale, DASS21 = Depression Anxiety and Stress Scale (short-form), CORE = Clinical Outcomes in Routine Evaluation, BAVQ = Beliefs about Voices Questionnaire, SCL-90 = Symptoms Checklist-90, VRS = Voice Rank Scale, PEM = Points Exceeding Median analysis.

Comparators: Three studies included a comparator group; two were set up as randomised-controlled designs (1, 2), and another was a single-session experimental design (3). Comparator groups comprised treatment as usual (1), continuation of treatment in a mindfulness model (2,) or an experimental control group comprising neutral imagery (3). Group allocation and randomisation procedures were described adequately in two studies (1,3).

Outcomes: All studies employed self-report scales to assess psychiatric symptoms and psychopathology; these were heterogeneous and included measures of depression, anxiety, PTSD, psychosis, and borderline symptomology (see Table 2 for details). One study used a clinician-assessed measure of psychiatric functioning (1). All studies included a measure of self-criticism and/or shame. The most commonly used measure of self-criticism was the Forms of Self-Criticizing/Attacking and Self-Reassuring Scale (FSCRS; Gilbert, Clarke, Hempel, Miles & Irons, 2004) (2,3,4,7,8,9,12,13) and the most commonly used measure of shame was the Other as Shamer Scale (OAS; Goss, Gilbert & Allan, 1994) (4,6,8,9,13). Two studies used non-published qualitative self-report measures of shame and self-criticism (10,11).

Study designs: Two studies in the review employed randomised controlled designs (1,2), one employed an experimental design (3), seven were cohort designs (4,5,6,7,8,9,10), and three were case-series or case-study designs (11,12,13). All studies measured psychological symptoms and functioning pre-and-post intervention, with four studies including follow-up measurement (6,7,8,12). Repeated measures statistics were employed to measure pre-to-post change for studies with group data. Case studies employed the reliable change index or descriptive and graphical methods to show improvement (11,12,13).

Quality assessment: Only one study met the criteria to be rated *strong* according to the EPHPP criteria (1), nine met criteria for *moderate* rating (2,3,4,5,6,7,8,9,13), and three were rated as *weak* (10,11,12). One study employing a randomised controlled design was rated as *strong* (1), with cohort designs predominantly rated *moderate* (4,5,6,7,8,9), and case series predominantly *weak* (11,12). The most common source of bias was the lack of blinding of researchers and participants to the study aims and intervention status (2,3,4,5,6,7,8,9,10,11,12,13). Other sources of risk of bias included intervention integrity (2,6,7,9,13), and analyses (10,12,13).

Changes in self-criticism and shame

In answer to review question one, changes in self-criticism and shame were evaluated. Most studies in the review demonstrated significant pre-to-post intervention reductions in self-reported self-criticism (2,4,7,8,9,11,12,13), shame (1,4,5,6,8,9,11,13), or both (4,9,11,13). The two studies that did not report significant reductions were compassion-focussed imagery interventions; one involved a single exposure (3) and the other only had available data for a single week of practice (10).

Case-series and case-study designs showed that most participants in each study experienced reductions in self-criticism (12,13), and shame and self-criticism (11). However, two of these studies were rated as *weak* in terms of quality (11,12). The strength of these findings was further affected by the lack of standardised measures of shame and self-criticism (11), and the use of compassion-focussed techniques as an enhancement to the primary model of therapy (13).

Studies employing cohort designs reported heterogeneous pre-to-post-intervention effects. Laithwaite et al. (2009) reported a small but significant reduction

in shame, although only after the 6-week follow-up. Although effect sizes were unavailable, Lucre and Corten (2013) reported significant post-intervention reductions in shame and self-criticism that were maintained at 1-year follow-up. Several cohort studies reported large effect sizes (greater than $d = 0.8$) for pre-to-post intervention reductions in self-criticism (4,7,9) and shame (5,9). With one exception (5), these studies were group interventions run by clinicians trained in the compassion-focussed approach. However, only two of these studies included a follow-up period (5,7) so the long-term effectiveness of these interventions was not fully addressed. Moreover, these studies only met criteria to be rated *moderate* on the quality assessment tool. Thus, these data should be interpreted with caution due to the inherent limitations of the cohort designs (no control group) giving rise to significant risk of demand bias, especially when outcome measures are self-report data. Further risks of bias are identified in Table 2. For example, Judge et al. (2012) had a dropout rate of 36% representing a moderate risk of attrition bias. Furthermore, some studies involved participants who were engaged in additional therapeutic programs (7,9) making it difficult to attribute the reported results solely to the compassion-focused intervention.

Studies employing randomised controlled designs failed to show significant post-intervention group differences in shame or self-criticism (1,2). The only study rated as *strong* on the quality assessment tool (Braehler et al., 2013), did not present pre-to-post intervention changes in shame. Similarly, although Feliu-Soler et al. (2016) showed within-group post-intervention reductions in self-criticism, they did not find significant differences in group analyses between the compassion-focussed group and the mindfulness group. Moreover, as mindfulness-based approaches have been shown to increase compassion (e.g. Kuyken et al., 2010), the inclusion of

a mindfulness control group makes evaluating the relative impact of the compassion-focused intervention problematic in this study. In addition, both studies suffered from a lack of statistical power, and only one included intention-to-treat analyses to account for attrition rates (2). Given these findings, and the limitations of studies employing non-controlled designs, studies in the current review provided only modest evidence that compassion-focused interventions can reduce shame and/or self-criticism.

Changes in psychopathology and functioning

In answer to review question two, changes in psychopathology and psychological functioning were evaluated. Studies in the review reported reductions in psychopathology relating to depression (1,4,6,7,8,9,13), anxiety (4,7,9), psychosis (1,6,12), borderline symptomology (2), PTSD (5,13), and social anxiety (11). One study found no change in psychopathology following intervention (3), and one study did not report post-intervention data on psychiatric symptoms (10).

Several cohort studies meeting the *moderate* criteria on the quality assessment tool reported large effects sizes in terms of clinical presentation and psychopathology (4,5,7,9). Alliger-Horn et al. (2016) showed large post-intervention reductions in PTSD symptomology in a cohort of soldiers, and Ashworth et al. (2015) reported large reductions in depression and anxiety in their cohort of brain-injured patients. Both studies reported that changes were maintained at follow-up. Other cohort studies with good follow-up periods also reported significant albeit more modest findings (6,8).

By contrast, studies employing controlled designs reported less clear cut findings. Two controlled studies meeting the *moderate* criteria on the quality

assessment tool failed to report group differences. Feliu-Soler et al. (2016) did not show pre-to-post intervention group differences between compassion-focussed and mindfulness groups in terms of borderline symptomology. In a single-exposure experimental design, Ascone et al. (2016) failed to report group differences in self-reported paranoia between participants engaging in compassion-focussed imagery and neutral imagery. By contrast, Braehler and colleagues (2013) reported that participants receiving group CFT showed better clinician-reported improvements in symptoms of psychosis compared to treatment as usual (moderate-large effect). Although this study was rated as *strong* on the quality assessment tool, the authors did not report group analyses for self-report data, suggesting that there may not have been consistent findings between clinicians and participant perceptions of psychosis symptomology.

Perhaps the most inconsistent findings were, somewhat surprisingly, those relating to changes in compassion. Of the six studies measuring compassion, only half reported increases; one in the narrative recovery style (1), one in terms of ability to generate compassionate imagery (10), and one in the Self-Compassion Scale (SCS), although this increase was not significant compared to the control group (2). The other studies failed to show significant post-intervention increases in compassion on the SCS (3,6,12).

Processes and mechanisms

Several studies investigated the relationship between changes in compassion and/or self-criticism and shame and psychiatric symptoms. One randomised-controlled study reported significantly stronger correlations between increases in compassion and reductions in depression and social marginalisation in the

compassion-focussed group compared to treatment as usual (1). The authors suggested that the development of affiliative affect reduced participants' sense of exclusion and isolation and related depressive symptoms. Although this study achieved a *strong* rating on quality assessment tool, formal mediation analyses were not conducted. Moreover, the potential validity of this finding was reduced by pre-intervention group differences in depression in this study.

Two cohort studies with *moderate* ratings on the quality assessment tool related participants' pre-intervention psychopathology to their post-intervention gains (4,5). One showed that participants with high levels of depression and shame demonstrated the biggest reductions in self-criticism following a compassion-focussed group (4). The other reported that soldiers with high pre-intervention levels of guilt and shame gained the greatest post-intervention improvement in terms of PTSD symptomology (5). Both findings point towards the potential moderating effect of pre-treatment levels of shame on the efficacy of compassion-focussed approaches.

Overall, such findings provide little evidence for the mediating role of shame or self-criticism in the relationship between compassion and psychopathology and tentative evidence that compassion-focused interventions are moderated by trait levels of shame. However, the absence of controlled experimental designs (4,5) or statistical methods of mediation or moderation (1,4,5) mean that causation cannot be inferred and the nature of the hypothesised relationships remains speculative.

Discussion

The current review aimed to address 1) whether compassion-focussed interventions reduce shame and/or self-criticism in clinical populations, and 2) whether changes in shame and self-criticism are related to psychopathology and psychological functioning. Several studies presented evidence to suggest that compassion-focussed interventions can reduce self-reported levels of shame, self-criticism, and psychopathology in a variety of clinical presentations. However, the strength of the findings was affected by methodological weaknesses. Overall, there was a lack of controlled studies and those with more rigorous designs reported less evidence for the efficacy of compassion-focused interventions.

Theoretical implications

It is hypothesised that the negative relationship between compassion and psychopathology is mediated by reductions in shame and self-criticism as individuals learn to regulate the threat system and promote parasympathetic activation and affiliative affect (Gilbert 2009, 2014). Although studies in the current review presented evidence of concurrent reductions in shame and/or self-criticism and psychopathology following compassion-focused interventions, they did not investigate mediation processes. However, studies of non-clinical samples have shown that shame mediates the negative relationship between compassion and depressive symptoms, and that compassion-focused interventions can effectively reduce state shame relative to other interventions (Johnson & O'Brien, 2013).

Further studies in non-clinical populations have demonstrated that trait self-criticism moderates the effectiveness of compassion-focused interventions whereby individuals with high self-criticism benefitted more from the intervention (Kelly, Zuroff,

Foa & Gilbert, 2010). Two studies in the review presented correlational evidence in support of this hypothesis (4,5) although the findings were in relation to shame rather than self-criticism. However, the lack of statistical moderation mean these relationships remain speculative in clinical populations. Moreover, the opposing relationship has been reported whereby individuals with high trait self-criticism have difficulties developing compassion (Gilbert et al., 2011; Kirschner, 2016).

Most studies in the review either failed to assess, or failed to show, post-intervention increases in compassion. In such cases, it is hard to determine whether *compassion* influences self-criticism /shame or whether observed changes are a function of other factors. Moreover, the studies in the relied upon *trait* measures of shame, self-criticism, and compassion to demonstrate therapeutic change. However, such measures are designed to probe well established behaviours, attitudes, and beliefs, may not be sensitive to short-term change. Furthermore, self-report measures are susceptible to demand effects (Williamson, 2007). Another way of investigating mechanisms underpinning compassion-focused interventions may be to measure *state* changes in the putative biological and psychological mechanisms of change. Paradigms employing state measures of affect, implicit processing, and physiology have been shown to be sensitive to brief compassion-focused interventions, and can detect changes in parasympathetic activation that purportedly reflect the impact of compassion on the soothing system (Kirschner, 2016).

Clinical implications

Despite the limitations described above, studies employing group-based compassion-focused interventions in heterogeneous clinical populations consistently reported pre-to-post intervention reductions in measures of shame, self-criticism, and

psychopathology (1,4,6,7,8,9). Such findings are important for healthcare providers as they provide preliminary evidence that compassion-focussed interventions may provide a transdiagnostic approach that is most effectively delivered in a group setting. However, it should be noted that shame and self-criticism were not the primary outcome measures in any of the studies in the current review; the paradigms were not explicitly set-up to investigate the impact of compassion-focused interventions on these purported transdiagnostic mechanisms of change. Thus, although studies in the review suggest that compassion-focused approaches can benefit people with range of psychopathologies, they are unable to elucidate whether (a) participants with different mental health difficulties all experience elevated levels of shame and self-criticism, and (b) reductions in shame and self-criticism mediate reductions in psychopathology.

Nevertheless, the findings of the current review are consistent with a building body of research that has shown compassion-focussed approaches to be effective in reducing psychopathology and increasing functioning and wellbeing in a variety of clinical and non-clinical populations (Leaviss & Uttley, 2015; Kirby et al., 2015), and those which show that increases in compassion are related to the amount of formal practice participants engage in (Jazaieri et al., 2013). The review conducted by Leaviss and Uttley (2015) differed from the current review by including non-clinical populations, self-help interventions, and studies in which shame and/or self-criticism were not explicitly measured. Of note, several non-clinical studies included in the Leaviss & Uttley (2015) review employed RCT designs and recruited large numbers of participants that allowed moderation effects to be investigated (Kelly et al., 2010; Shapira & Mongrain, 2010). Results from these investigations indicated that individuals with high trait self-criticism benefited more from the compassion-focused

intervention. However, these studies also reported that experimental control conditions were as effective as the compassion-focused interventions in reducing psychopathology and increasing functioning. Thus, it remains unclear as to whether compassion-focused approaches are more or less effective at reducing psychopathology than other therapeutic approaches.

Limitations

The current review did not employ inter-rater checks to evaluate data searches, eligibility screening, data extraction, or quality appraisal. As such, the review is more susceptible to the pre-existing biases and assumptions held by the investigator in relation to compassion-focused interventions. The review was potentially limited by the exclusion of non-peer-reviewed studies and non-published data that may have introduced publication bias to the selection procedure. Heterogeneity in terms of study design and the inclusion of case-study and case-series studies meant that effect size data was missing in some instances and statistical synthesis was not possible. Finally, the decision to only include clinical populations may have prevented studies investigating mechanisms of change from being considered in the review.

Synopsis and future directions

The current review has found preliminary evidence for the effectiveness of compassion-focused approaches for working with the pervasive psychological difficulties of shame and self-criticism. However, the strength of the evidence is currently limited by a paucity of controlled studies explicitly designed to investigate changes in shame and self-criticism. Although RCTs are the gold standard in terms of evaluating evidence of efficacy (NICE, 2004), some authors have criticised the

utility of RCTs in psychotherapy research and highlighted the need for study designs that enable the investigation of hypothesised mechanisms of change (Kadzin, 2007; Westen, Novotny, & Thompson-Brenner, 2004).

Thus, the current review highlights the need for studies which (a) explicitly investigate the impact of compassion-focussed approaches on the hypothesised mechanisms of change, i.e. shame and self-criticism, (b) directly evaluate compassion-focussed approaches against other evidence-based approaches, (c) employ state measures of hypothesised biological and psychological correlates of change, (d) employ controlled designs with adequate sample sizes to allow moderation and mediation analyses, and (e) employ tighter control of implementation and delivery of compassion-focussed interventions to facilitate model fidelity and reduce contamination effects.

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Appendices

Appendix A: PRISMA checklist



PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 5(6): e1000097. doi:10.1371/journal.pmed1000097

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PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria; participants; and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	

Page 1 of 2

Appendix B. Summary of interventions.

Table A-1.

Summary of Interventions

Study	Intervention
Gilbert & Proctor, 2006; Judge et al., 2012; Braehler et al., 2013; Lucre & Corten, 2013; Ashworth et al., 2015	Group Compassion Focussed Therapy (CFT) /Compassionate Mind Training (CMT) † Group programme based on Gilbert's compassion focused therapy. Main components: <ul style="list-style-type: none"> • Psycho-education and formulation within the evolutionary model and compassion framework. • Exploring safety behaviours, self-criticism and self-attacking behaviours, and addressing fears of compassion. • Developing empathy for one's own distress • Developing compassionate images and letters.
Mayhew & Gilbert, 2008; Ashworth et al., 2015;	Individual Compassion Focussed Therapy (CFT) /Compassionate Mind Training (CMT) † Individual programme based on Gilbert's compassion focused therapy. Main components: <ul style="list-style-type: none"> • Psycho-education and formulation within the evolutionary model and compassion framework. • Exploring safety behaviours, self-criticism and self-attacking behaviours, and addressing fears of compassion. • Developing empathy for one's own distress • Developing compassionate images and letters.
Bowyer et al., 2014; Boersma et al., 2015;	Adapted Compassion Focused Therapy Individual sessions based on Gilbert's compassion focused therapy. Bowyer et al., 2014: Use of compassion focussed formulation to understand PTSD response and maintenance processes (shame and self-criticism) following trauma. Use of compassionate imagery to develop self-soothing. Boersma et al., 2015: Adaptation of self-help material on building social confidence based on CFT

Gilbert & Irons, 2004;	Compassion Focussed Imagery
Ascone et al., 2016	Guided exercises focussing on attributes of compassion e.g. empathy, sympathy, warmth, self-acceptance and development of imagery embodying these attributes.
Feliu-Soler et al., 2016	Loving Kindness Meditation/Compassion Meditation (LKM/CM) 3-week group program including the following components: <ul style="list-style-type: none"> • Psychoeducation based on Gilbert's model of compassion. • Dialectical behaviour therapy based techniques of kindness and affection (e.g. half-smiling, willing hands) • Loving kindness meditation and techniques from CMT (e.g. compassionate touches and compassionate letters)
Laithwaite et al., 2009	Recovery after Psychosis (RAP) Module 1: Understanding psychosis and recovery. Module 2: Focussed on the components of compassion and the development of an "ideal friend" (i.e. compassionate image) through guided discovery. Module 3: Planning for recovery.
Alliger-Horn et al., 2016	Imagery Re-scripting and Reprocessing Therapy (IRRT) Imagery based trauma-focused treatment including: <ul style="list-style-type: none"> • Imaginal exposure: visual and affective reliving of the entire traumatic scene; • Mastery imagery: visualising one's <i>current self</i> entering the trauma scene to confront and disempower the perpetrator; • Compassionate imagery: visualising one's <i>current self</i> nurturing, calming, understanding and reassuring the <i>traumatised self</i>.

†CFT refers to the overarching theoretical model and CMT refers to the development of specific skills and attributes of compassion (Gilbert, 2009).

Appendix C: EPHPP Quality Assessment Tool for Quantitative Studies

QUALITY ASSESSMENT TOOL FOR QUANTITATIVE STUDIES



COMPONENT RATINGS

A) SELECTION BIAS

(Q1) Are the individuals selected to participate in the study likely to be representative of the target population?

- 1 Very likely
- 2 Somewhat likely
- 3 Not likely
- 4 Can't tell

(Q2) What percentage of selected individuals agreed to participate?

- 1 80 - 100% agreement
- 2 60 - 79% agreement
- 3 less than 60% agreement
- 4 Not applicable
- 5 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

B) STUDY DESIGN

Indicate the study design

- 1 Randomized controlled trial
- 2 Controlled clinical trial
- 3 Cohort analytic (two group pre + post)
- 4 Case-control
- 5 Cohort (one group pre + post (before and after))
- 6 Interrupted time series
- 7 Other specify _____
- 8 Can't tell

Was the study described as randomized? If NO, go to Component C.

No Yes

If Yes, was the method of randomization described? (See dictionary)

No Yes

If Yes, was the method appropriate? (See dictionary)

No Yes

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

C) CONFOUNDERS**(Q1) Were there important differences between groups prior to the intervention?**

- 1 Yes
- 2 No
- 3 Can't tell

The following are examples of confounders:

- 1 Race
- 2 Sex
- 3 Marital status/family
- 4 Age
- 5 SES (income or class)
- 6 Education
- 7 Health status
- 8 Pre-intervention score on outcome measure

(Q2) If yes, indicate the percentage of relevant confounders that were controlled (either in the design (e.g. stratification, matching) or analysis)?

- 1 80 – 100% (most)
- 2 60 – 79% (some)
- 3 Less than 60% (few or none)
- 4 Can't Tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

D) BLINDING**(Q1) Was (were) the outcome assessor(s) aware of the intervention or exposure status of participants?**

- 1 Yes
- 2 No
- 3 Can't tell

(Q2) Were the study participants aware of the research question?

- 1 Yes
- 2 No
- 3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

E) DATA COLLECTION METHODS**(Q1) Were data collection tools shown to be valid?**

- 1 Yes
- 2 No
- 3 Can't tell

(Q2) Were data collection tools shown to be reliable?

- 1 Yes
- 2 No
- 3 Can't tell

RATE THIS SECTION	STRONG	MODERATE	WEAK
See dictionary	1	2	3

F) WITHDRAWALS AND DROP-OUTS**(Q1) Were withdrawals and drop-outs reported in terms of numbers and/or reasons per group?**

- 1 Yes
- 2 No
- 3 Can't tell
- 4 Not Applicable (i.e. one time surveys or interviews)

(Q2) Indicate the percentage of participants completing the study. (If the percentage differs by groups, record the lowest).

- 1 80 -100%
- 2 60 - 79%
- 3 less than 60%
- 4 Can't tell
- 5 Not Applicable (i.e. Retrospective case-control)

RATE THIS SECTION	STRONG	MODERATE	WEAK	
See dictionary	1	2	3	Not Applicable

G) INTERVENTION INTEGRITY**(Q1) What percentage of participants received the allocated intervention or exposure of interest?**

- 1 80 -100%
- 2 60 - 79%
- 3 less than 60%
- 4 Can't tell

(Q2) Was the consistency of the intervention measured?

- 1 Yes
- 2 No
- 3 Can't tell

(Q3) Is it likely that subjects received an unintended intervention (contamination or co-intervention) that may influence the results?

- 4 Yes
- 5 No
- 6 Can't tell

H) ANALYSES**(Q1) Indicate the unit of allocation (circle one)**

community organization/institution practice/office individual

(Q2) Indicate the unit of analysis (circle one)

community organization/institution practice/office individual

(Q3) Are the statistical methods appropriate for the study design?

- 1 Yes
- 2 No
- 3 Can't tell

(Q4) Is the analysis performed by intervention allocation status (i.e. intention to treat) rather than the actual intervention received?

- 1 Yes
- 2 No
- 3 Can't tell

GLOBAL RATING**COMPONENT RATINGS**

Please transcribe the information from the gray boxes on pages 1-4 onto this page. See dictionary on how to rate this section.

A	SELECTION BIAS	STRONG	MODERATE	WEAK
		1	2	3
B	STUDY DESIGN	STRONG	MODERATE	WEAK
		1	2	3
C	CONFOUNDERS	STRONG	MODERATE	WEAK
		1	2	3
D	BLINDING	STRONG	MODERATE	WEAK
		1	2	3
E	DATA COLLECTION METHOD	STRONG	MODERATE	WEAK
		1	2	3
F	WITHDRAWALS AND DROPOUTS	STRONG	MODERATE	WEAK
		1	2	3
				Not Applicable

GLOBAL RATING FOR THIS PAPER (circle one):

- | | | |
|---|----------|----------------------------|
| 1 | STRONG | (no WEAK ratings) |
| 2 | MODERATE | (one WEAK rating) |
| 3 | WEAK | (two or more WEAK ratings) |

With both reviewers discussing the ratings:

Is there a discrepancy between the two reviewers with respect to the component (A-F) ratings?

No Yes

If yes, indicate the reason for the discrepancy

- | | |
|---|---|
| 1 | Oversight |
| 2 | Differences in interpretation of criteria |
| 3 | Differences in interpretation of study |

Final decision of both reviewers (circle one):

- | | |
|----------|-----------------|
| 1 | STRONG |
| 2 | MODERATE |
| 3 | WEAK |

Appendix D: Author information pack, Clinical Psychology Review.



CLINICAL PSYCHOLOGY REVIEW

AUTHOR INFORMATION PACK

TABLE OF CONTENTS

•	Description	p.1
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•	Editorial Board	p.2
•	Guide for Authors	p.3



ISSN: 0272-7358

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School of Psychology

Doctorate in Clinical Psychology

Empirical Paper

The effect of self-compassion on negative self-referential processing and its psychophysiological correlates following a social evaluative stress.

Trainee Name: **Lewis Pettit**

Primary Research Supervisor: **Dr. Anke Karl**

Senior Lecturer in Clinical Psychology

University of Exeter

Secondary Research Supervisor: **Prof. Ed Watkins**

Professor of Experimental and Clinical Psychology

University of Exeter

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Abstract

The current study investigated the effectiveness of a Loving Kindness Meditation (LKM) to attenuate negative emotional processing and promote recovery following social evaluative stress. An experimental design utilising self-report, self-referential, and physiological measures of heart rate variability (HRV), skin conductance level (SCL), and heart rate (HR) was employed to investigate processes that occur during social stress and subsequent stress recovery period. Compared to participants receiving a neutral induction ($n = 28$), participants receiving a LKM ($n = 28$) reported increases in state affiliative affect. However, the differences were not significant. Although the LKM and Neutral groups showed reductions in sympathetic activity (SCL and HR) and increases in parasympathetic activity (HRV), there was no difference between the groups. In addition, no group differences were observed in self-referential processing. Moderation analyses revealed that participants in the LKM group with high trait self-criticism reported higher post-induction affiliative affect. By contrast, participants in the LKM group with high trait self-criticism exhibited more post-induction negative self-referential processing. These findings suggest that there may be marked differences between self-reported experience and behavioural experience. The current study highlights the importance of triangulating data and suggests that single induction self-compassion meditations may not promote recovery from social stress.

Keywords: Self-compassion, physiology, social anxiety, stress, recovery.

Introduction

Self-criticism and social evaluation

Self-criticism can be defined as persistent negative self-evaluations that elicit feelings of shame and low self-worth (Falconer, King & Brewin, 2015). It is thought to be a significant transdiagnostic process influencing psychopathology (Brewin & Firth-Cozens, 1997; Hewitt & Flett, 2002; Ingram, 2003; Koerner & Linehan, 1996; Pagura, Cox, Sareen & Enns, 2006). Mental health difficulties such as depression, post-traumatic stress disorder (PTSD), and social anxiety disorder have been associated with elevated levels of self-criticism (Cox et al., 2000; Cox, Fleet & Stein, 2004; Harman & Lee, 2010; Kopala-Sibley, Zuroff, Russell & Moskowitz, 2014).

Negative social evaluations are thought to induce strong negative self-evaluations and self-critical thinking that commonly precede depressive episodes (Blatt, 1991; Gunthert, Cohen, Butler, & Beck, 2007; Ingram, Miranda, & Segal, 1998; Leary, 2004). Furthermore, the threat of negative social evaluation plays a major role in the development and maintenance of social anxiety (e.g. Clark and Wells, 1995). Cognitive models of social anxiety postulate that the combination of perceived social danger and the processing of the self as a social object produce an intolerable anxiety response. Self-referential cognitive processes including internalised attention, expectancy-versus-outcome appraisals, and negative self-evaluations are key mechanisms in these models (Rapee & Heimberg, 1997). Such negative self-referential processing likely contributes to maladaptive rumination, the depletion of attentional resources, and avoidance of interpersonal experiences.

Compassion and social evaluation

Given that self-criticism in the face of social evaluation is dependent on negative self-referential cognitions, a potential antidote may be the development of self-compassion, which fosters a warm and accepting stance on those aspects of our character and behaviour that we dislike (Neff 2003a). According to Neff (2003b), self-compassion promotes:

1. Kindness and non-judgmental understanding.
2. The de-isolation of human distress and suffering and the idea of common humanity.
3. The balanced awareness of thoughts and feelings through mindfulness.

In the context of negative social evaluations, the first two components of self-compassion may be especially pertinent. When confronting feelings of inadequacy or failure, self-compassionate individuals offer themselves kindness, warmth, and non-judgmental understanding rather than self-criticism. Moreover, the process of de-isolation recognises that being imperfect or making mistakes are part of the shared human experience rather than just that of the individual (Werner et al., 2012).

Whereas self-criticism in times of adversity triggers activation of the threat-system and maladaptive emotion regulation (e.g. feelings of isolation, self-judgement, and negative affect), it is hypothesised that self-compassion facilitates the regulation of the threat system and the promotion parasympathetic activity and affiliative affect known as the soothing-system (Gilbert, 2009, 2014).

Compassion and social stress reactivity

The cultivation of compassion has been shown to attenuate maladaptive cognitive and emotional reactions to stress. Stress reactivity can be defined as the threshold needed to trigger a stress response and the magnitude of that response (Britton, Sahar, Szepeswol & Jacobs, 2012). High stress reactivity triggers negative cognitive biases as well as associated limbic and sympathetic nervous system activation, resulting in escalation of the distressing episode (Siegle, Thompson, Carter, Steinhauer, & Thase, 2007). There now exists a considerable body of evidence to suggest that self-compassion is associated with higher levels of positive affect and adaptive functioning, and lower levels of self-criticism, depression, anxiety, and social stress reactivity (e.g. Neff & Vonk, 2009; Neely, Schallert, Mohammed, Roberts, & Chen, 2009; Neff, Hsieh, & Dejitterat, 2005; Leary, Tate, Adams, Allen & Hancock, 2007; Neff & Germer, 2013; Breines et al., 2015). Other investigators have demonstrated that self-compassion can be increased by engaging in a single induction of a self-compassion meditation (Kirschner, Kuyken & Karl, 2013; Diedrich, Grant, Hofmann, Hiller & Berking, 2014). Kirschner and colleagues (2013) showed that compared to rumination and control conditions, participants who listened to a Loving Kindness Meditation (LKM) reported higher levels of self-compassion and lower levels of self-criticism, and exhibited reduced sympathetic arousal and increased parasympathetic activity.

Several studies have employed the Trier Social Stress Test (TSST) to investigate the effect of compassion-focused and mindfulness approaches on social evaluative stress. The TSST is a role-play scenario in which participants are required to make a presentation to a panel of “assessors”. It has been shown to be a reliable laboratory induction of social stress (Allen, Kennedy, Cryan, Dinan & Clarke, 2014).

Pace and colleagues (2009) reported that increased compassion meditation practice was associated with reduced TSST induced stress reactivity as measured by biological (stress hormone Interleukin-6) and self-report measures of stress. A randomised control trial by Britton et al. (2012) comparing an 8-week Mindfulness Based Cognitive Therapy (MBCT) to a waitlist control condition showed that participants who completed the MBCT group demonstrated decreased emotional reactivity to the TSST. Similar results have been reported in a study employing brief (10 mins x 4 days) compassion training (Arch et al., 2014). Compared to control conditions, compassion training attenuated stress reactivity to the TSST as indicated by increased parasympathetic (heart rate variability) and reduced sympathetic arousal and subjective anxiety responses. The effects of compassion on subjective anxiety and heart rate variability were most evident during the stress recovery period (10-20 min post TSST).

The TSST places high demands on researcher resources as it requires several “assessors” to be involved in the experimental procedure. However, an alternative to the TSST, The Montreal Imaging Stress Task (MIST; Dedovic et al., 2005), has been developed for use in imaging environments where it is not possible for participants to make a presentation to a panel of assessors. Instead, social evaluative stress is induced by engaging participants in a task and providing negative feedback by way of a mock performance comparison with their peers as well as from the experimenter. The MIST has been shown to reliably increase salivary cortisol levels analogous to the TSST (Dedovic et al., 2005; Pruessner et al., 2008).

Aims

Previous research has suggested that the cultivation of self-compassion is protective against the cognitive, emotional, and physiological effects of social stress; however, the putative underlying mechanisms remain unclear. The current study aims to build on the work described above by investigating the psychological and psychophysiological mechanisms of self-compassion during the stress recovery period following a social evaluative stress. In addition, a behavioural paradigm was employed to investigate the implicit processing of the compassionate constructs of common humanity and de-isolation, and kindness and non-judgemental understanding that may attenuate threat responses following a social stressor. Self-referential tasks measure response latencies to forced-choice decisions about self-descriptive adjectives and have been shown to reliably identify self-relevant constructs (Markus, 1977). Given the assumption that the to-be-measured attribute exists, implicit tasks measure automatic processing occurring in the absence of awareness, goals, or cognitive resources (De Houwer & Moors, 2007), whilst avoiding the pitfalls of social desirability and demand characteristics inherent in self-report measures. Commonly used implicit paradigms infer psychological attributes of an individual from the response latencies (e.g. reaction times) or accuracy with which the individual responds to task stimuli (De Houwer, 2003).

Thus, the current study aimed to investigate the effectiveness of self-compassion induction (LKM) compared to a neutral induction to attenuate negative processing and promote adaptive functioning following a social evaluative threat. It aimed to triangulate psychological and physiological processes by investigating self-report, self-referential, and psychophysiological changes that occur during a social evaluative threat and subsequent stress recovery period.

Hypotheses

Compared to participants engaging in the neutral induction, during the stress recovery period participants engaging in the self-compassion (LKM) induction will:

1. Exhibit a significant increase in affiliative state as indicated by:
 - a. Increases in self-reported state measures of kindness and common humanity.
 - b. A decrease in self-report state measure of self-judgment.
2. Exhibit a significant increase in parasympathetic activity and reduced sympathetic activity as indicated by:
 - a. Increased heart rate variability (HRV)
 - b. Reduced skin conductance level (SCL), and heart rate (HR)
3. Exhibit a significant decrease in post-induction negative self-referential processing as indicated by:
 - a. Relatively increased preference and decreased latencies for “self-kindness”, “common humanity” adjectives.
 - b. Relatively decreased preference and increased latencies for “isolation”, “self-judgment” adjectives.
4. Trait self-compassion and self-criticism will moderate the relationship between group (LKM or Neutral) and post-induction changes in state self-compassion/self-criticism and negative self-referential processing.

Method

Design

The study employed an experimental 2x3 mixed factorial design, with a between-subject factor of group (self-compassion induction versus neutral induction) and a within-subjects factor of time (baseline, post-stress, post-induction). The independent variables were group (self-compassion induction versus neutral induction), the dependent variables were state self-compassion, state self-criticism, state stress, self-referential processing, HR, HRV, and SCL. The moderator variables were trait self-compassion and self-criticism. Participants were randomly assigned to groups using a random number generator (<https://www.randomizer.org/>).

Target sample size was based on an a-priori power calculation using G*Power (version 3.1.3; Faul, Erdfelder, Buchner & Lang, 2009). Previous studies employing LKM report large effect sizes for changes in self-report self-compassion (Kirschner, 2016). However, participants in that study were not administered a stressor prior to the LKM induction. To provide a conservative estimate, power analyses for the current study were conducted for medium effect sizes. Analyses were calculated for 80% power with an alpha error rate of 0.05. To investigate group differences by way of ANOVA for self-report, behavioural, and physiology data, it was calculated that thirty-six participants would be necessary to detect medium effects ($\eta p^2 = 0.15$). To investigate moderation analyses, it was calculated the fifty-five participants would be necessary to detect medium effects ($R^2 = 0.15$).

Participants

Undergraduate students were recruited via the University of Exeter's research participation system (SONA) and received course credits for participation. A total of fifty-six participants completed the study. Participants were native English speakers with normal or corrected to normal vision and hearing. Participants reporting high levels of depression, post-traumatic stress, or with current or historical psychiatric difficulties were excluded. See Figure 1 for details of participant flow through the study.

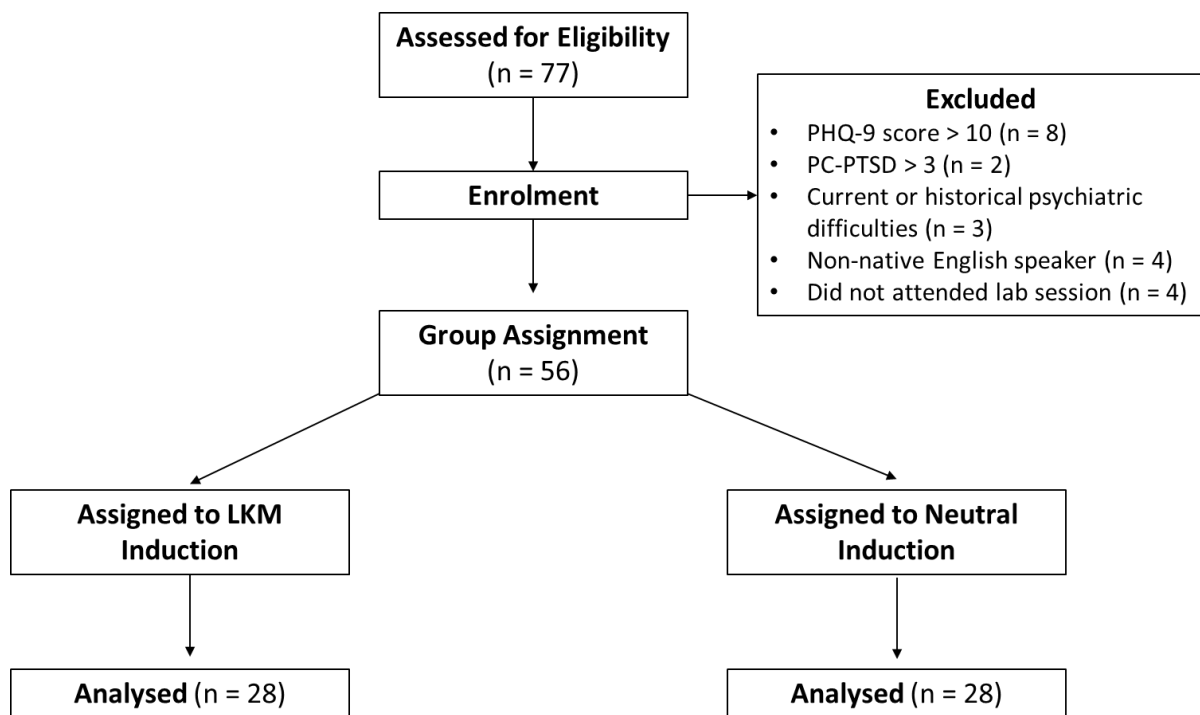


Figure 1. Participant flow through study.

Ethical approval and considerations

Participants excluded on this basis of depression and PTSD screening, or with current or a history of psychiatric difficulties, received an information pack about depression/PTSD/mental health difficulties including links to local support services

(Appendix A). Eligible participants received an information sheet and provided written informed consent prior to the experimental procedure, and received a debriefing sheet at the end of the study (Appendix B). The study was approved by the University of Ethics Research Ethics Committee² (Appendix C).

Measures

Screening measures. See Appendix D for full measures. The *Patient Health Questionnaire-9* (PHQ-9; Kroenke, Spitzer, & Williams, 2001) was employed to screen for depression. The PHQ-9 assesses self-reported depressive symptoms on items scored from 0 (not at all) to 3 (nearly every day), with a maximum of score 27. It has good reliability (internal $\alpha = .89$, test re-test $\alpha = .84$) and scores > 10 can be used as a standardised cut-off for depression. The current study employed this cut-off for participant exclusion criteria.

The *Primary Care Post-Traumatic Stress Disorder* screen (PC-PTSD; Prins, et al., 2003) is a 4-item screen that was designed for use in primary care and other medical settings. It comprises four introductory sentences to cue respondents to traumatic events. Responses are either “yes” or “no”. Results of the PC-PTSD are considered “positive” if a participant answered “yes” to any 3 items. The current study employed this cut-off for participant exclusion criteria.

Trait measures of compassion, self-criticism, and stress. See Appendix E for full measures. The *Self-Compassion Scale* (SCS; Neff, 2003b), was used assess trait self-compassion. It is a 26 item self-report measure using a five-point Likert scale ranging from 1 (“almost never”) to 5 (“almost always”). Participants indicate

² Ref: 2016/1245 (rev2)

how they typically act towards themselves during difficult times. The scale measures six dimensions of compassion: mindfulness (Cronbach $\alpha = .75$ for current sample), over-identification (Cronbach $\alpha = .84$ for current sample), self-kindness (Cronbach $\alpha = .86$ for current sample), self-judgement (Cronbach $\alpha = .85$ for current sample), common-humanity (Cronbach $\alpha = .83$ for current sample), and isolation (Cronbach $\alpha = .70$ for current sample). A total self-compassion score comprises the sum of the subscale scores with a maximum score of 130; higher scores indicate a greater amount of self-compassion.

The *Functions of Self-Criticising/Attacking Scale* (FSCS; Gilbert, Clarke, Kempel, Miles, & Irons, 2004) was used to assess trait self-criticism. This is a 21-item scale which assesses participants' thoughts about *why* they are self-critical. The scale uses a five-point Likert scale ranging from 0 ("not at all like me") to 4 ("extremely like me"). Two subscales measure function of self-criticising/attacking; one for self-persecution and one for self-correction; Cronbach's $\alpha = .88$, and $\alpha = .89$ respectively in the current sample.

The *Perceived Stress Scale* (PSS; Cohen, Kamarck & Mermelstein, 1983) was used to assess participants' appraisal of stressful situations. It is a 10-item self-report measure using a Likert scale ranging from 0 ("never") to 4 ("very often") where higher total scores indicate greater perception of stress. The scale has excellent internal consistency, with reported Cronbach $\alpha = .91$ in population-based studies (Cohen & Janicki-Deverts, 2012).

Experimental manipulations. The *Montreal Imaging Stress Task* (MIST; Dedovic et al., 2005) was employed to induce social evaluative stress. The MIST comprises a series of mental arithmetic tasks displayed on a computer screen.

Solutions are always a single-digit number and participants submit their answers by keyboard response. After a practice run, the MIST program calibrates task difficulty to just beyond the individual's capacity ensuring that participants get no more than between 25 – 50% of trials correct. Individuals are informed that their performance is being compared to the performance of other participants within the study and that they must achieve accuracy greater than 90% for their data to be included in the study (an unachievable standard). In addition, a mock performance display indicates poor performance by the individual in comparison to the average performance, and the experimenter provides negative feedback between each run of the task. Participants engaged in a practice run (without time limits or negative feedback), followed by two stress-inducing runs (3 minutes per run). The duration of the task is analogous to that administered by Dedovic et al. (2005) within an imaging environment. The MIST was piloted with five clinical psychology trainees and produced a reliable physiological stress response.

Loving Kindness Meditation (LKM; Kirschner, 2016) is a guided self-compassion induction designed to induce feelings of compassion, specifically towards the self. The LKM was developed in collaboration with an experienced mindfulness teacher and comprises a script guiding participants towards developing compassion towards others initially, and then themselves. The 12-minute script was audio-recorded by the mindfulness teacher and delivered via headphones; see Appendix F for full script. Previous studies have demonstrated that the LKM increases self-reported self-compassion, decreases physiological markers of sympathetic arousal, and increases parasympathetic activity (Kirschner, 2016).

Supermarket Induction (Kirschner, 2016) is a guided induction designed to be neutral in content. It comprises a 12-minute audio recording by the same mindfulness teacher and delivered via headphones. Participants are guided towards the experience of carrying out a supermarket shop, including entering the supermarket, choosing various items to buy, and proceeding to the check-out. See Appendix G for full script. Previous studies have shown that the supermarket induction does not impact self-report measures of self-compassion, or physiological markers of sympathetic and parasympathetic activity (Kirschner, 2016).

State measures of self-compassion, self-criticism, and stress. *Visual Analogue Scales* (VAS; adapted from Kirschner, 2016; Wolpe, 1990) were employed to measure state levels of self-compassion and self-criticism, as well as state levels of distress. Three scales were used to assess compassion; self-compassion, kindness and understanding, and tolerance (Cronbach's $\alpha = .81$ in the current study), one scale assessed common humanity (togetherness), one assessed self-criticism, and one assessed subjective units of distress (SUDS). Each VAS measured the subjective intensity of the above constructs. Scales were presented on a computer screen with the mouse used to indicate responses on a sliding scale between 0 (lowest subjective intensity) and 100 (highest subjective intensity). See Appendix H for exact wording of each scale.

Self-Referential Task (adapted from Markus, 1977). In the current study, participants were presented with adjectives associated with four dichotomous constructs of the self-compassion scale; kindness and non-judgmental understanding versus self-judgment, and common humanity versus isolation. Adjectives were chosen based on the definitions, and synonyms of those definitions,

provided by Neff (2003b), the English Lexicon Project website (<http://elexicon.wustl.edu/>), and consultation with two mindfulness practitioners and trainers working within the Mindfulness Based Cognitive Therapy program at the University of Exeter. Adjectives comprised those with positive valences and negative valences, e.g. “Connected” (common humanity) versus “Detached” (isolation) or “Tolerant” (kindness and understanding) versus “Critical” (self-judgemental). A pilot study was conducted by psychology undergraduates at the University of Exeter (Jones, 2016) to assess the construct validity of the self-referential adjective categories in relation to the SCS, and ensure that each construct had adequate internal consistency. See Appendix I for a summary of the pilot study and a list of trait adjectives used in the current study.

Apparatus. The testing was run and behavioural data collected using E-prime 2 software (Psychology Software Tools; Sharpsburg, PA) running on a standard PC with a 17” CRT monitor; responses were recorded using a standard keyboard.

Experimental Design. As shown in Figure 2, each trial consisted of a fixation cross presented for 500 milliseconds (ms), followed by the presentation of an adjective for which participants indicated whether the word was self-descriptive (“me”) or not (“not me”). Responses were made by pushing identified buttons on the keyboard with the participant’s dominant hand and response latencies were recorded. This was followed by a blank screen presented for 1500ms. In total, participants completed 100 trials (20 kindness and understanding, 20 common humanity, 20 self-judgemental, 20 isolation, and 20 neutral adjectives). Stimuli were pseudo-randomly presented, with no more than two words of the same condition repeated. Participants familiarised themselves with the task by completing a practice run with 10 trials.

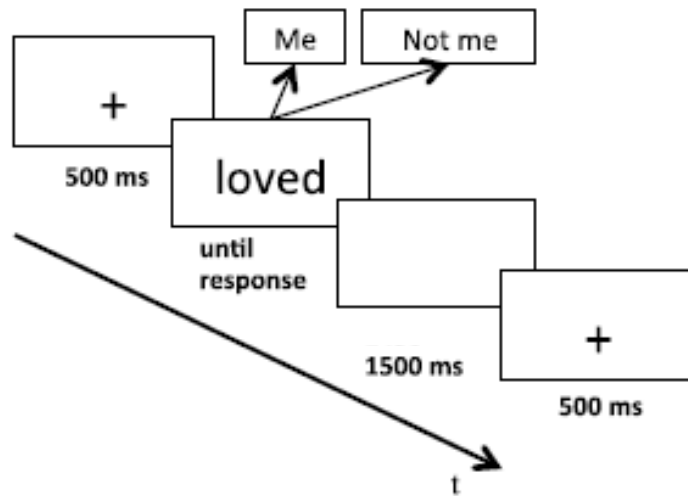


Figure 2. Self-referential task trial procedure.

Self-referential task properties. Psychometric properties of the self-referential task were investigated for the current sample. All tasks showed good internal consistency as assessed by Cronbach's alpha ($> .80$), and significant Spearman's correlations were found between word preferences (number of "me" responses for each construct) and the corresponding SCS subscale score. Full results are displayed in Table 1 and 2.

Table 1.

Cronbach's Alpha for Self-Referential Task Constructs by Timepoint

Construct	Post-MIST	Post-induction	Average
Self-Kindness	.87	.83	.90
Common Humanity	.87	.83	.89
Self-Judgement	.84	.84	.89
Isolation	.89	.84	.92

MIST = Montreal Imaging Stress Test

Table 2.

Correlations Between Post-MIST Word Preferences and SCS Subscale Scores

SCS subscale	“Me” Responses			
	Self-Kindness	Common Humanity	Self-Judgement	Isolation
Self-Kindness	$\rho = .35$ $p = .004$			
Common Humanity		$\rho = .62$ $p < .001$		
Self-Judgement			$\rho = .28$ $p = .020$	
Isolation				$\rho = .43$ $p < .001$

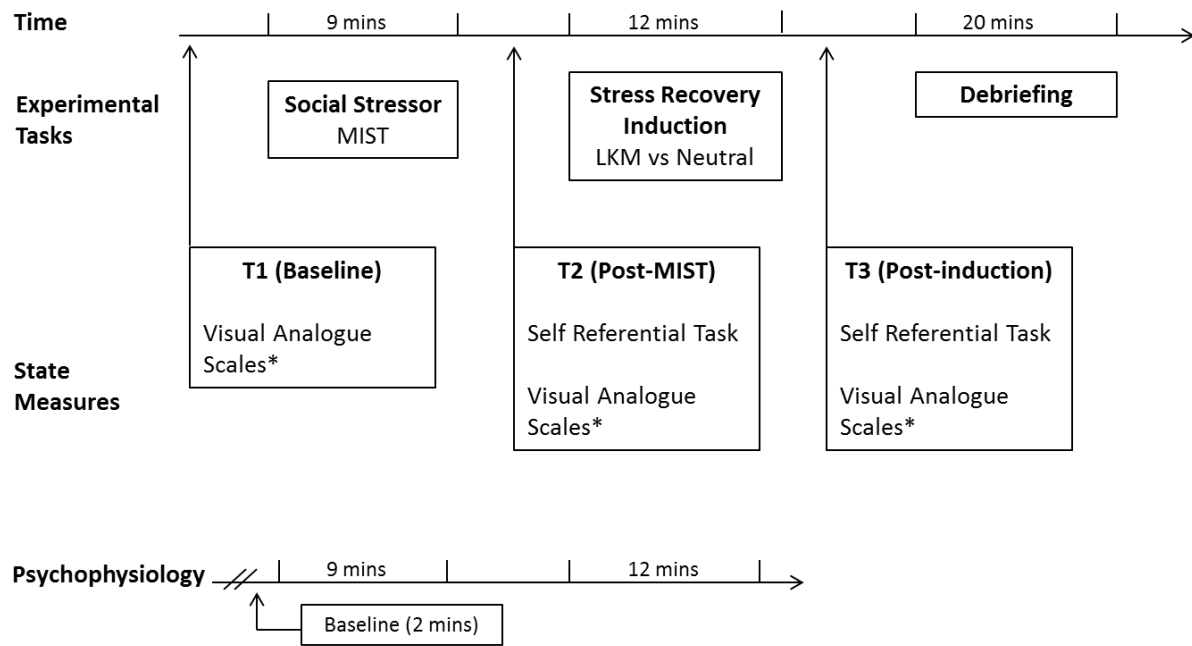
SCS = Self-Compassion Scale

Psychophysiological measures. HR and SCL were employed as markers of sympathetic arousal (Jung et al., 2000; Sokolov, 1963;) and HRV as a marker of parasympathetic activation (Thayer & Lane, 2000). SCL was recorded using a BIOPAC MP150 system and SCL100C amplifier and a skin resistant transducer (TSD203) from the middle phalanx of the first and ring finger of the participant's non-dominant hand at a sampling rate of 500 Hertz (Hz) with a low pass filter of 1.0 Hz. HR and HRV was determined from the electrocardiogram (ECG) using standard procedures (Berntson et al., 1997; Berntson & Stowell, 1998; Solem, Laguna & Sornmo, 2006). ECG was continuously recorded from below the participant's right collar bone and the participant's left side, underneath the ribcage using a BIOPAC ECG100C amplifier at a sampling rate of 1 kHz with a low pass filter of 35 Hz and a high pass filter of 0.5 Hz. Data was filtered and corrected offline using specialised

analysis programmes within the AcqKnowledge 4.2 software (BIOPAC Systems; Goleta, CA). Mean HRV, SCL, and HR values were determined for the 9-minute MIST condition and 12-minute inductions in one-minute segments. A 2-minute period prior to the MIST condition was used as a baseline. See Appendix J for full data processing procedures.

Procedure

Participants were screened for the exclusion criteria (PHQ-9, PC-PTSD) and asked to complete the trait measure questionnaires (SCS, FSCS, PSS) using an online survey. Eligible participants were invited to the laboratory session. Following informed consent, baseline measures of state affect (self-compassion, self-criticism, and stress) were recorded before participants engaged in the social stress task (MIST). Post-MIST assessments of state affect and self-referential processing were then administered. Depending on group allocation, participants then listened to either the Neutral induction or LKM induction. Finally, the post-induction (i.e. the stress recovery period) assessments of state affect measures and self-referential processing were administered. Psychophysiological measurements were recorded through-out the experimental procedure. Figure 3 provides details of the experimental procedure.



*self-compassion, kindness and understanding, tolerance, togetherness, self-criticism, SUDS

Figure 3. Experimental procedure.

Data Analysis

Shapiro-Wilk tests were employed to assess normality. Data was analysed using parametric group analyses and repeated measures for mixed factorial designs. Where parametric assumptions were violated (normality, variance homogeneity, and sphericity), nonparametric Mann Whitney U-tests and Rank Analysis of Covariance (ANCOVA) were applied.

Manipulation checks. Repeated measures analyses were employed to investigate whether the MIST condition effectively induced self-reported stress, and whether the subsequent induction conditions promoted stress recovery. Mixed Analysis of Variance (ANOVA) procedures were conducted for the SUDS data. The within-subjects factor was time (baseline, post-MIST, and post-induction) and the between-subjects factor was group (LKM and Neutral).

Hypothesis 1 statistics. Differences between participants in the LKM and Neutral groups for self-reported affiliative affect during the stress recovery period were investigated by conducting a series of mixed ANOVAs for the VAS data. The within-subjects factor was time (post-MIST and post-induction) and the between-subjects factor was group (LKM and Neutral).

Hypothesis 2 statistics. Differences between participants in the LKM and Neutral groups for physiological responses during the stress recovery period were investigated by conducting mixed ANOVAs for HRV, SCL, and HR data. The within-subjects factor was time (MIST and meditation) and the between-subjects factor was group (LKM and Neutral). Responses were calculated to investigate the average *change* in HRV, SCL, and HR between the baseline and MIST conditions (post-MIST data), and average *change* in HRV, SCL, and HR between the MIST condition and the meditation condition (post-induction data).

Hypothesis 3 statistics. Hypothesised group differences in behavioural data for the self-referential task during the stress recovery period were investigated by conducting ANCOVAs. ANCOVAs allow group differences in post-induction data to be investigated, whilst controlling for post-MIST scores. This is crucial for the reaction time (RT) data for which there is a likely effect of repetition/familiarity during the second presentation of the self-referential adjectives (Bertelson, 1963). In line with the experimental hypotheses, preference and reaction time data for “Me” responses for Self-Kindness and Common Humanity adjectives, and “Not-Me” responses for Self-Judgement and Isolation adjectives were analysed. Post-induction data for the relevant variables were entered as dependent variables and post-MIST data were entered as the covariates, with Group (LKM vs Neutral) entered as the fixed factor for each analysis. Exploration of preference and reaction

time data revealed that the data was not normally distributed. Therefore, ANCOVAs of the rank-transformed data were conducted (Feys, 2016).

Hypothesis 4 statistics. To determine whether individual differences in trait self-compassion and trait self-criticism predicted change in state affect and/or self-referential processing, simple moderation analyses were run. Analyses were conducted with residual gain scores for post-MIST to post-induction changes (VAS state measures and self-referential adjective preferences) as dependent variables, group as the independent variable (dummy coded Neutral = 0, LKM = 1), and trait measures of self-compassion (SCS total and subscales) and self-criticism (FSCS total and subscales) as moderators. The moderator variables were not mean-centred (Kromrey & Foster-Johnson, 1998). Analyses were run using the PROCESS procedure for SPSS provided by Hayes (2012). To further characterise the nature of significant interactions, the Johnson–Neyman (J–N) technique was employed (Johnson & Neyman, 1936; Potthoff, 1964).

Results

Sample characteristics and baseline statistics

Descriptive statistics were calculated for the sample for demographic variables, trait measures and baseline measures of state affect (Table 3). The full data set was available for all participants. Group analyses revealed that the LKM group and Neutral group were comparable in terms of demographic data, trait-level compassion and self-criticism, and baseline state measures of self-kindness, self-judgement, common humanity, and distress.

Table 3.

*Mean Scores for Group on Demographic Data, Trait Measures, and Baseline VAS
State Measures and Group Comparisons*

Variable	Range	LKM (n=28) M (SD)	Neutral (n=28) M (SD)	Test Statistic	df	p
Age	18-34	20.25 (4.52)	19.79 (3.02)	$U = .44$	54	.66
Gender	15 M, 41 F	5 Male (18%)	10 Male (36%)	$\chi^2 = 2.28$	1	.13
PHQ 9	0-14	4.50 (3.58)	3.11 (2.85)	$U = -1.64$	54	.10
PSS total	16-27	21.57 (3.10)	21.11 (2.64)	$t = .60$	54	.55
SCS self-kindness	5-25	15.61 (3.90)	15.96 (4.94)	$t = -.30$	54	.76
SCS self-judgement	6-25	15.82 (4.35)	14.50 (5.23)	$t = 1.03$	54	.31
SCS common humanity	4-20	12.93 (4.03)	12.93 (3.65)	$t < .01$	54	1.00
SCS isolation	5-19	11.96 (3.02)	13.43 (3.40)	$t = -1.70$	54	.10
SCS mindfulness	7-20	14.25 (3.09)	13.82 (3.52)	$t = .49$	54	.63
SCS over-identification	4-20	11.11 (3.79)	12.36 (4.05)	$t = -1.19$	54	.24
SCS total (1 – 130)	52-112	81.68 (11.47)	83.00 (12.04)	$t = -.42$	54	.68
FSCS self-persecution	0-25	4.39 (4.83)	3.61 (5.37)	$U = -1.40$	54	.16
FSCS self-correction	3-41	25.68 (9.51)	21.61 (10.96)	$t = 1.48$	54	.14
FSCS total	3-64	30.07 (12.18)	25.21 (14.37)	$t = 1.37$	54	.18
Compassion	17-99	61.07 (17.87)	67.68 (21.12)	$t = -1.26$	54	.21
Kindness and Understanding	23-100	66.45 (18.20)	72.04 (20.23)	$U = 1.05$	54	.29
Tolerance	6-99	58.13 (23.99)	58.39 (27.71)	$t = -.04$	54	.97
Kindness Composite †	16-98	61.88 (17.88)	66.04 (21.00)	$t = -.80$	54	.43
Self-criticism	0-90	39.30 (27.52)	32.04 (24.71)	$U = -.97$	54	.33
Togetherness	6-100	73.70 (22.84)	77.21 (17.79)	$U = .60$	54	.56
SUDS	0-76	33.71 (20.51)	28.95 (15.43)	$t = .98$	54	.33

LKM = Loving Kindness Meditation, PHQ 9 = Patient Health Questionnaire, SCS = Self Compassion Scale, FSCS = Functions of Self-Criticism Scale, PSS = Perceived Stress Scale, † Composite of Compassion, Kindness and Understanding, and Tolerance³, Visual Analogue Scale scores. SUDS = Subjective Units of Distress.

³ Kindness Composite, comprises mean VAS scores of Baseline Compassion, Baseline Kindness and Understanding, and Baseline Tolerance; Cronbach Alpha = .88.

Manipulation checks

Subjective Units of Distress. A mixed ANOVA revealed a significant main effect of time, $F(2, 108) = 81.86$, $p < .001$, $\eta^2 = .603$, but no significant effect of group, $F(1, 54) = .23$, $p = .634$, $\eta^2 = .004$, or group by time interaction $F(2, 108) = .75$, $p = .474$, $\eta^2 = .014$. Planned comparisons of the main effect of time revealed significant differences in SUDS scores between baseline and post-MIST, $F(1, 54) = 52.42$, $p < .001$, $\eta^2 = .493$, as well as between post-MIST and post-induction; $F(1, 54) = 135.02$, $p < .001$, $\eta^2 = .714$. Thus, both groups reported a significant increase in distress following the MIST followed by a significant decrease in distress after the induction. The data are presented in Figure 4.

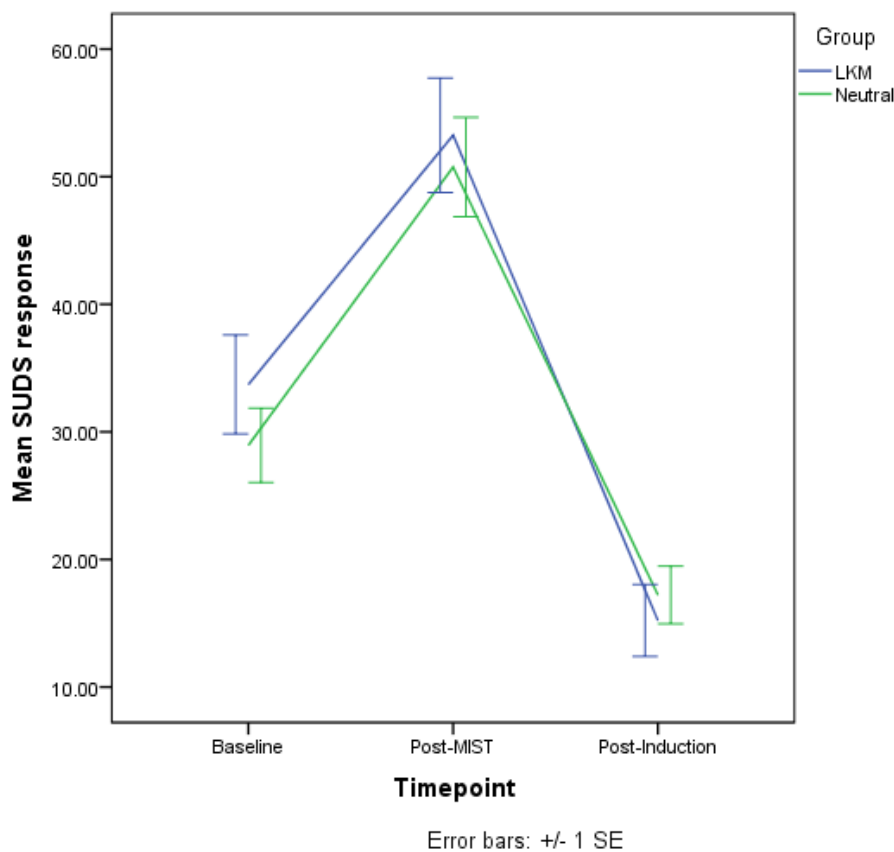


Figure 4. Mean self-reported distress by group and main effect of time.

Hypothesis testing

Descriptive statistics and effect sizes for post-MIST and post-induction data for self-reported affect, self-referential processing, and physiology variables are presented in Table 4.

Hypothesis 1a. For Kindness (Composite of Kindness and Understanding, Self-Compassion, and Tolerance VASs, Figure 5), a mixed ANOVA revealed a significant main effect of time, $F(1, 54) = 22.29, p < .001, \eta^2 = .29$, but no significant effect of group, $F(1, 54) = .057, p = .811, \eta^2 = .001$. In addition, there was a trend towards a group by time interaction, $F(1, 54) = 2.84, p = .098, \eta^2 = .050$. Effect size analyses in Table 4 show that the LKM group reported a large increase in the Kindness composite following the induction condition, whereas the Neutral group reported a small increase.

For Common Humanity (Togetherness VAS, Figure 6), there was a significant main effect of time, $F(1, 54) = 8.02, p = .007, \eta^2 = .129$, but no significant effect of group, $F(1, 54) = .62, p = .433, \eta^2 = .011$. In addition, there was a trend towards a group by time interaction $F(1, 54) = 3.16, p = .081, \eta^2 = .055$. Effect size analyses show that the LKM group reported a large increase in the Togetherness following the induction condition, whereas the Neutral group reported a small increase.

Hypothesis 1b. For Self-Judgement (Self-Critical VAS, Figure 7), there was a significant main effect of time, $F(1, 54) = 44.79, p < .001, \eta^2 = .453$, but no significant effect of group, $F(1, 54) = .27, p = .607, \eta^2 = .005$, or group by time interaction $F(1, 54) = .25, p = .620, \eta^2 = .005$. Table 4 shows that both groups reported a large decrease in Self-Criticism following the inductions.

Thus, although participants in the LKM group reported larger increases in affiliative affect than participants in the Neutral group, these differences were not statistically significant.

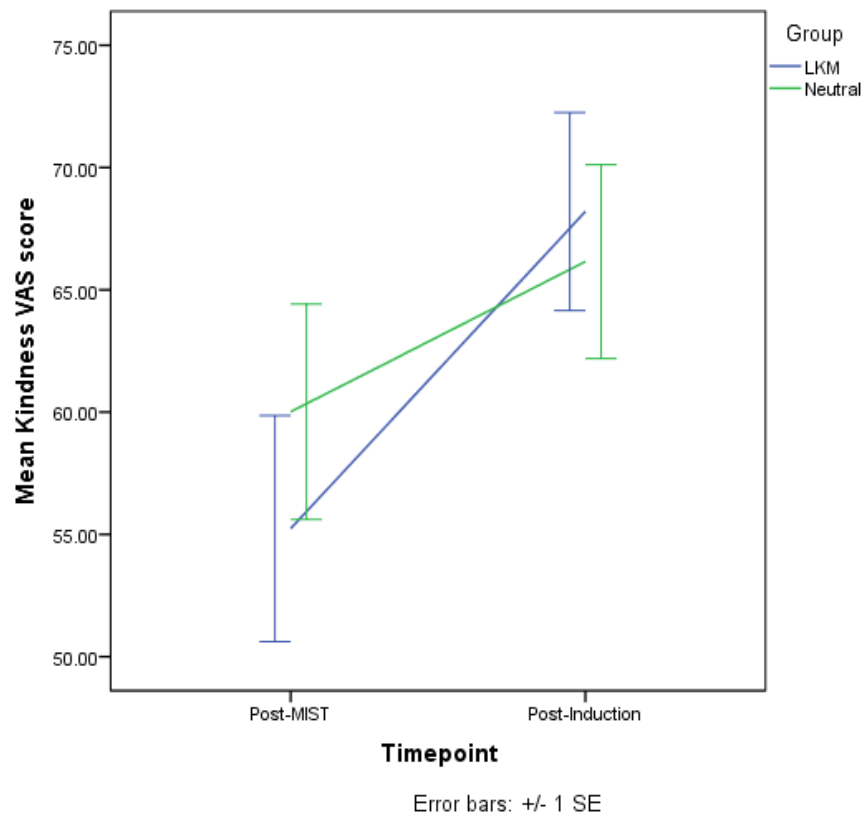


Figure 5. Mean Kindness VAS by group and condition.

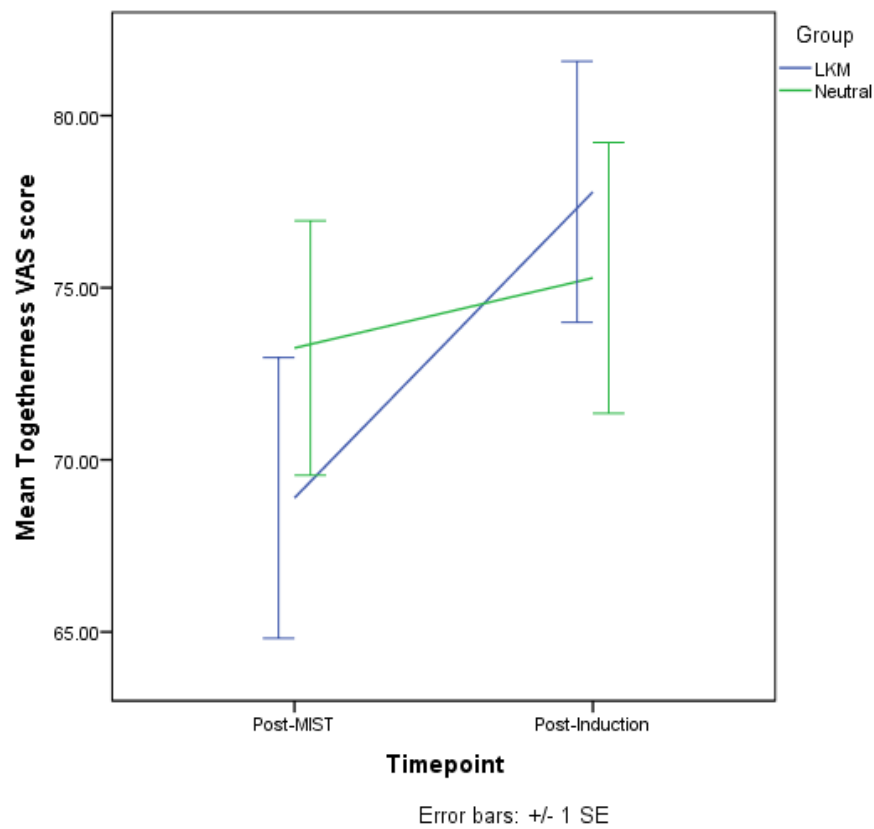


Figure 6. Mean Togetherness VAS by group and condition.

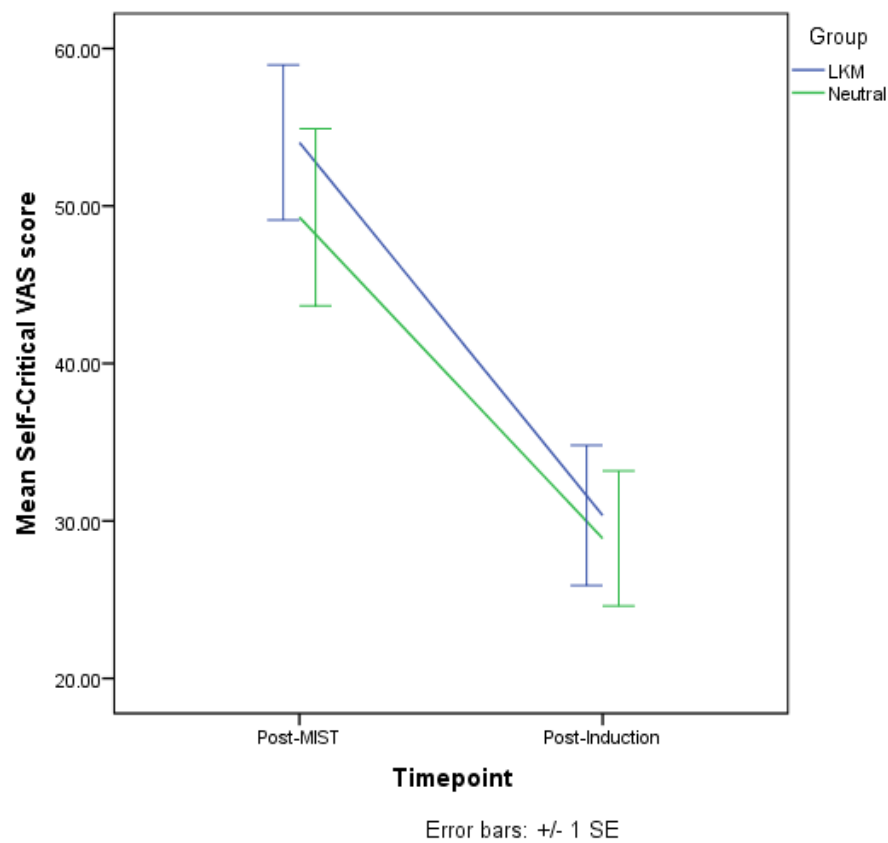


Figure 7. Mean Self-Critical VAS by group and condition.

Table 4.

Mean Scores and Effect Sizes for Group on Self-Reported Affect, Self-Referential Processing, and Physiology by Condition.

Variable	Post-MIST LKM <i>M</i> (<i>SD</i>)	Post-MIST Neutral <i>M</i> (<i>SD</i>)	Post-induction LKM <i>M</i> (<i>SD</i>)	Post-induction Neutral <i>M</i> (<i>SD</i>)	Effect Size LKM	Effect Size Neutral
VAS Kindness	55.24 (24.46)	60.01 (23.31)	68.20 (21.40)	66.15 (20.96)	<i>dz</i> = .94	<i>dz</i> = .38
VAS Common Humanity	68.89 (21.59)	73.25 (19.57)	77.79 (20.07)	75.29 (20.84)	<i>dz</i> = .80	<i>dz</i> = .12
VAS Self-Judgement	54.04 (26.07)	49.29 (29.72)	30.36 (23.55)	28.89 (22.68)	<i>dz</i> = .97	<i>dz</i> = .82
HRV response change* (ms ² /Hz)	-0.51 (0.88)	-0.33 (0.78)	0.45 (0.89)	0.62 (0.63)	<i>dz</i> = .92	<i>dz</i> = 1.17
SCL response change* (μS)	0.33 (0.19)	0.33 (0.20)	-0.07 (0.28)	-0.11 (0.25)	<i>dz</i> = 1.32	<i>dz</i> = 1.68
HR response change* (BPM)	8.11 (9.05)	8.28 (8.32)	-9.50 (7.53)	-10.76 (9.69)	<i>dz</i> = 2.79	<i>dz</i> = 3.55
Me Kindness Preference	18.54 (1.60)	18.46 (2.17)	18.75 (1.86)	18.96 (1.77)	<i>r</i> = .10	<i>r</i> = .31
Me Common Humanity Preference	4.96 (4.34)	4.75 (4.02)	3.57 (3.99)	3.89 (3.88)	<i>r</i> = .37	<i>r</i> = .33
Not-Me Judgemental Preference	15.04 (2.90)	15.68 (3.03)	16.39 (2.30)	16.82 (2.42)	<i>r</i> = .44	<i>r</i> = .47
Not-Me Isolation Preference	3.18 (2.93)	2.71 (3.80)	2.18 (2.33)	2.32 (3.54)	<i>r</i> = .35	<i>r</i> = .17
Me Kindness RT (ms)	1043 (333)	1013 (268)	939 (298)	966 (293)	<i>r</i> = .29	<i>r</i> = .20
Me Common Humanity RT (ms)	1289 (459)	1347 (384)	1130 (376)	1090 (280)	<i>r</i> = .38	<i>r</i> = .55
Not-Me Judgemental RT (ms)	1281 (553)	1259 (388)	1058 (354)	1086 (329)	<i>r</i> = .37	<i>r</i> = .44
Not-Me Isolation RT (ms)	1307 (595)	1185 (331)	1030 (316)	1073 (367)	<i>r</i> = .58	<i>r</i> = .35

MIST = Montreal Imaging Stress Task, LKM = Loving Kindness Meditation, HRV = Heart Rate Variability, SCL = Skin Conductance Level, HR = Heart Rate, RT = Reaction Time, ms = milliseconds, * = relative to baselines prior to MIST or stress recovery inductions respectively, *dz* = Cohen's *d* for dependent samples, *r* = correlation coefficient for Wilcoxon *Z* (Tomczak & Tomczak, 2014), BPM = Beats per Minute, μS = microsiemens, ms²/Hz = milliseconds(squared)/hertz.

Hypothesis 2a. For the HRV data (Figure 8), a mixed ANOVA revealed a significant main effect of time, $F(1, 54) = 30.06, p < .001, \eta^2 = .358$, showing that both groups exhibited an increase in HRV during the induction condition, relative to the MIST condition. However, there was no significant effect of group, $F(1, 54) = 2.02, p = .161, \eta^2 = .036$, or group by time interaction $F(1, 54) = .002, p = .962, \eta^2 < .001$.

Hypothesis 2b. For the SCL data (Figure 9), there was a significant main effect of time, $F(1, 54) = 65.41, p < .001, \eta^2 = .548$, showing that both groups exhibited a decrease in SCL during the induction condition, relative to the MIST condition. However, there was no significant effect of group, $F(1, 54) = .23, p = .633, \eta^2 = .004$, or group by time interaction $F(1, 54) = .08, p = .783, \eta^2 = .001$.

For the HR data (Figure 10), there was a significant main effect of time, $F(1, 54) = 72.26, p < .001, \eta^2 = .572$, showing that both groups exhibited a decrease in HR during the induction condition, relative to the MIST condition. However, there was no significant effect of group, $F(1, 54) = .40, p = .528, \eta^2 = .007$, or group by time interaction $F(1, 54) = .11, p = .740, \eta^2 = .002$.

Thus, although both groups exhibited the expected increase in HRV and decrease in SCL and HR during the meditation conditions, there was no evidence that the measures of parasympathetic and sympathetic arousal were differentially affected by the LKM and Neutral meditations.

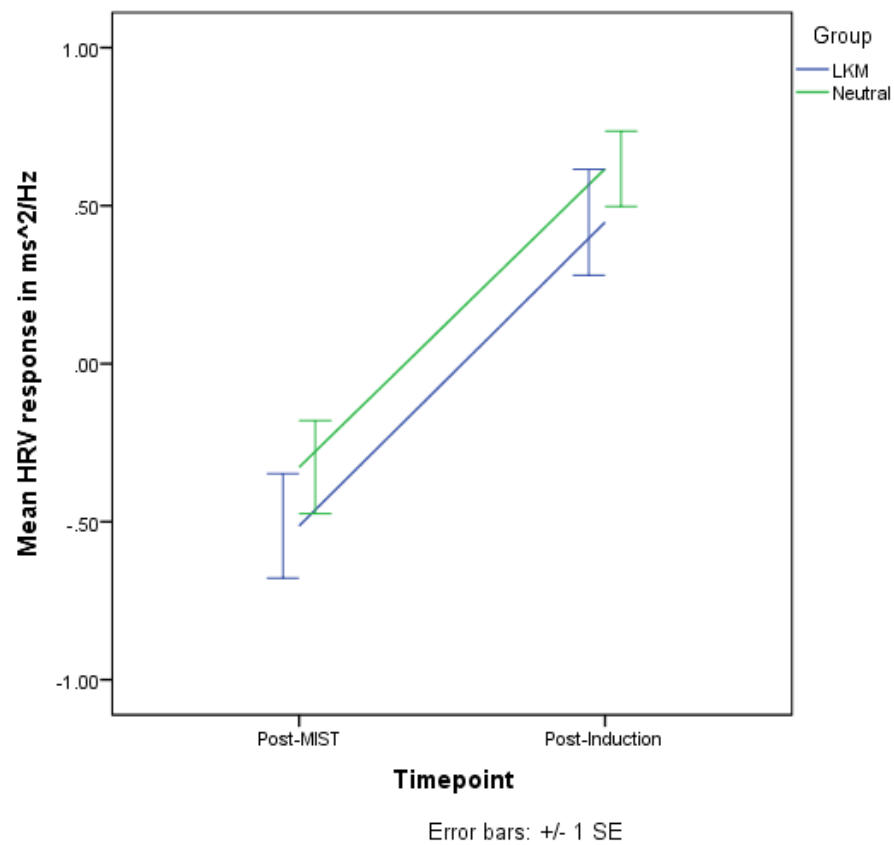


Figure 8. Mean HRV response by group and timepoint.

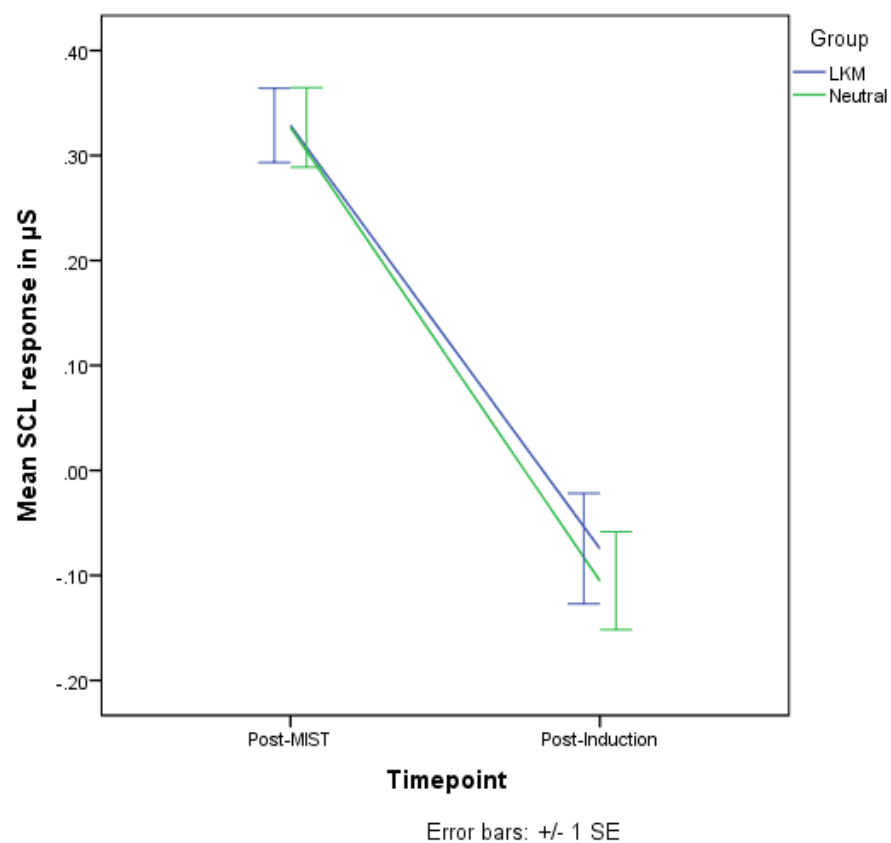


Figure 9. Mean SCL response by group and timepoint.

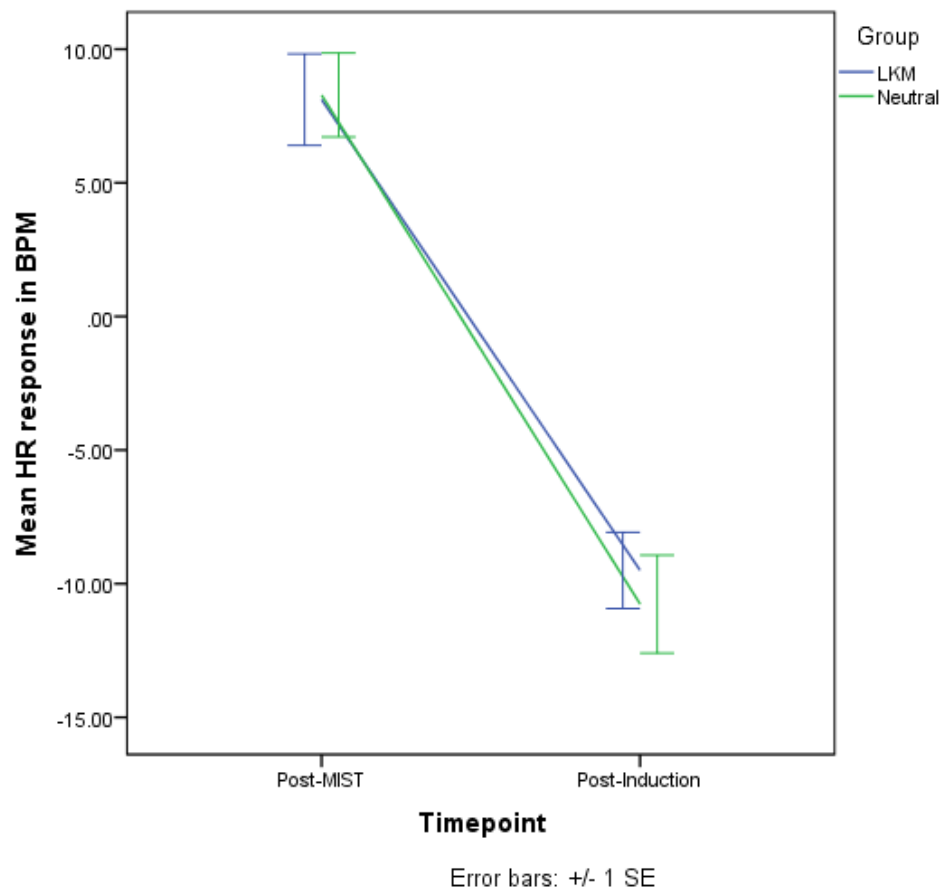


Figure 10. Mean HR response by group and timepoint.

Hypothesis 3a. Table 4 shows that only the Neutral group showed a small increase in preference for Kindness adjectives following the induction condition. The ANCOVA revealed that the covariate, post-MIST Kindness “Me” response, was significantly related to post-induction Kindness “Me” response, $F(1, 53) = 72.91$, $p < .001$, $\eta^2 = .579$. However, there was no significant effect of group on post-induction Kindness “Me” response after controlling for post-MIST Kindness “Me” response, $F(1, 53) = .16$, $p = .691$, $\eta^2 = .003$. Both groups showed small reduction in reaction times for Kindness adjectives (“Me” responses) following the inductions. The ANCOVA revealed that the covariate, post-MIST Kindness RT, was significantly related to post-induction Kindness RT, $F(1, 53) = 84.53$, $p < .001$, $\eta^2 = .615$.

However, there was no significant effect of group on post-induction Kindness RT after controlling for post-MIST Kindness RT, $F(1, 53) = .29$, $p = .592$, $\eta^2 = .005$.

Both groups showed a small decrease in preference for Common Humanity adjectives following the induction condition. The ANCOVA revealed that the covariate, post-MIST Common Humanity “Me” response, was significantly related to post-induction Common Humanity “Me” response, $F(1, 53) = 130.48$, $p < .001$, $\eta^2 = .711$. However, there was no significant effect of group on post-induction Common Humanity “Me” response after controlling for post-MIST Common Humanity “Me” response, $F(1, 53) = 1.09$, $p = .302$, $\eta^2 = .020$. Table 4 shows that the LKM group demonstrated a small decrease in reaction times for Common Humanity adjectives (“Me” responses) following the induction condition, and the Neutral group demonstrated a medium decrease in reaction times. The ANCOVA revealed that the covariate, post-MIST Common Humanity RT, was significantly related to post-induction Common Humanity RT, $F(1, 53) = 71.51$, $p < .001$, $\eta^2 = .574$. However, there was no significant effect of group on post-induction Common Humanity RT after controlling for post-MIST Common Humanity RT, $F(1, 53) = .98$, $p = .326$, $\eta^2 = .018$.

Hypothesis 3b. Table 4 shows that both groups showed a small decrease in preference for Self-Judgement adjectives (i.e. increase in “Not-Me” responses) following the induction condition. The ANCOVA revealed that the covariate, post-MIST Self-Judgement “Not-Me” response, was significantly related to post-induction Self-Judgement “Not-Me” response, $F(1, 53) = 93.24$, $p < .001$, $\eta^2 = .638$. However, there was no significant effect of group on post-induction Self-Judgement “Not-Me” response after controlling for post-MIST Self-Judgement “Not-Me” response, $F(1, 53) = .008$, $p = .929$, $\eta^2 < .001$. Both groups demonstrated a small decrease in

reaction times for Self-Judgemental adjectives (“Not-Me” responses) following the induction. The ANCOVA revealed that the covariate, post-MIST Self-Judgemental RT, was significantly related to post-induction Self-Judgemental RT, $F(1, 53) = 84.71$, $p < .001$, $\eta^2 = .615$. However, there was no significant effect of group on post-induction Self-Judgemental RT after controlling for post-MIST Self-Judgemental RT, $F(1, 53) = .38$, $p = .539$, $\eta^2 = .007$.

Table 4 shows the LKM group demonstrated a small increase in preference for Isolation adjectives (i.e. decrease in “Not-Me” responses) following the induction condition. The ANCOVA revealed that the covariate, post-MIST Isolation “Not-Me” response, was significantly related to post-induction Isolation “Not-Me” response, $F(1, 53) = 85.90$, $p < .001$, $\eta^2 = .618$. However, there was no significant effect of group on post-induction Isolation “Not-Me” response after controlling for post-MIST Isolation “Not-Me” response, $F(1, 53) = 1.41$, $p = .240$, $\eta^2 = .026$. The LKM group showed a medium decrease in reaction times for Isolation adjectives (“Not-Me” responses) following the induction, and the Neutral group showed a small decrease. The ANCOVA revealed that the covariate, post-MIST Isolation RT, was significantly related to post-induction Isolation RT, $F(1, 53) = 99.44$, $p < .001$, $\eta^2 = .652$. However, there was no significant effect of group on post-induction Isolation RT after controlling for post-MIST Isolation RT, $F(1, 53) = .80$, $p = .376$, $\eta^2 = .015$.

Thus, there was no evidence from the behavioural data that self-referential processing was differentially affected by the LKM and Neutral inductions.

Hypothesis 4. Change in the Togetherness VAS was predicted by the model with trait self-criticism (FSCS total score) as the moderator; $F(3, 52) = 2.40$, $p = .049$, $R^2 = .12$. There was a significant group x moderator interaction; $b = .04$, $t(52) = 2.14$,

$p = .037$. The Johnson-Neyman analysis revealed that the conditional effect of trait self-criticism on state togetherness change transitioned in significance at a FSCS sum-score of 30.94; $b = .53$, $SE = .27$, $t(52) = 2.01$ $p = .05$, 95% CI [.00, 1.07], with the relationship between state self-criticism change and induction group becoming significant at FSCS sum-scores above this threshold (41.1% in this sample). This indicated that participants with higher levels of trait self-criticism reported an increase in state togetherness (self-reported common humanity) after the loving kindness meditation (Figure 11).

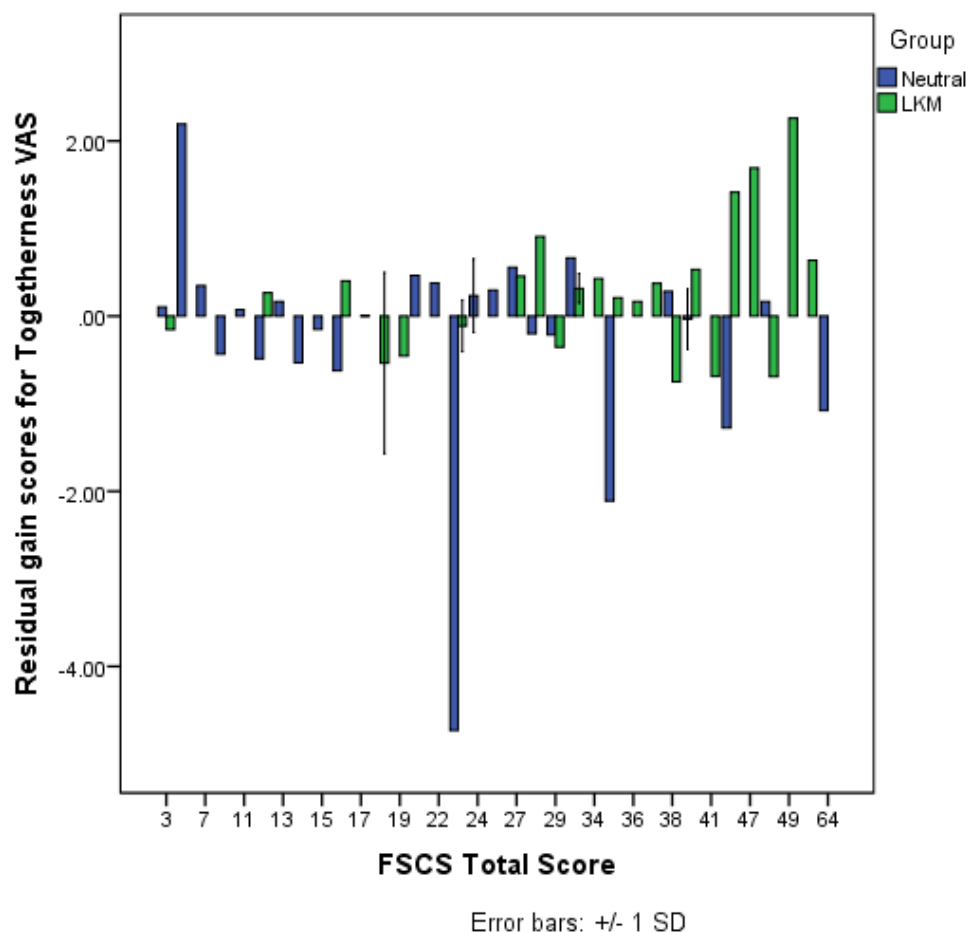


Figure 11. Residual gain scores for Togetherness VAS by FSCS Total Score and Group.

Change in Isolation adjective preference was also predicted by the model with trait self-criticism (FSCS total score) as the moderator; $F(3, 52) = 2.84, p = .047, R^2 = .14$. There was a significant group x moderator interaction; $b = .05, t(52) = 2.51, p = .015$. The Johnson-Neyman analysis revealed that the conditional effect of trait self-criticism on state togetherness change transitioned in significance at a FSCS sum-score of 34.40; $b = .57, SE = .31, t(52) = -2.01, p = .05, 95\% CI [.00, 1.14]$, with the relationship between state self-criticism change and induction group becoming significant at FSCS sum-scores above this threshold (33.9% in this sample). This indicated that participants with higher levels of trait self-criticism showed an *increase* in preference for isolation adjectives after the loving kindness meditation (Figure 12).

Models including trait self-compassion as moderators were not significant.

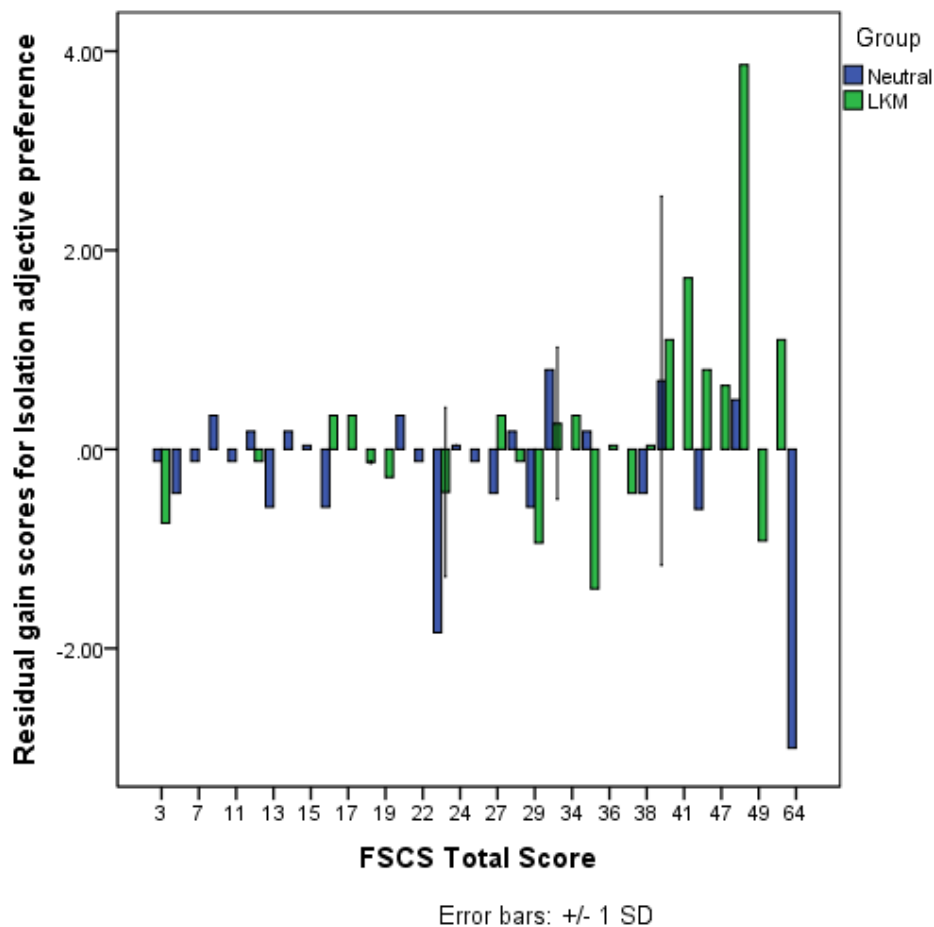


Figure 12. Residual gain scores for Isolation preference by FSCS Total Score and Group.

Discussion

The current study employed an experimental design to investigate whether a single induction of a self-compassion meditation could attenuate negative processing and promote recovery in response to social evaluative stress. It was hypothesised that relative to participants engaging in a Neutral induction, participants engaging in a LKM induction would demonstrate: increases in affiliative affect, increases in parasympathetic arousal with concordant decreases in sympathetic arousal, and decreases in negative self-referential processing during the stress recovery period. In addition, it was hypothesised that individual differences in trait self-compassion and self-criticism would moderate the relationship between group and post-induction changes in state self-compassion, self-criticism, and self-referential processing. Broadly speaking, some support was found for hypothesis four, but there was limited evidence to support hypothesis one, and no evidence to support hypotheses two and three; these findings will be discussed in detail below.

Experimental effects on state affiliative affect and physiology

Participants in both groups demonstrated an increase in affiliative affect following the stress recovery inductions. Although participants in the LKM group reported larger increases the Kindness Composite and Common Humanity VAS than participants in the Neutral group, these differences were not statistically significant. Both groups reported reductions in state self-criticism following the induction condition. However, this study provided no evidence that the LKM induction was more effective than the neutral induction in reducing state self-criticism. Changes in state affiliative effect were accompanied by the expected increase in parasympathetic activity (HRV) and decrease in sympathetic activity (SCL and HR)

during the stress recovery period. However, no differences were observed between participants in each group suggesting that the LKM induction was no more effective than the neutral supermarket induction in promoting adaptive physiological functioning.

Findings from the current study are not wholly consistent with those reported by Kirschner (2016) who found that only self-compassion inductions, not a neutral induction, increased affiliative affect and adaptive physiological functioning. However, participants in the Kirschner (2016) study were not exposed to a social evaluative stress before receiving the inductions. It may be the case that recovery from a social evaluative stress occurs spontaneously, especially in healthy individuals with adaptive coping strategies such as those recruited for the current study. As such, it may be difficult to observe any stress recovery effects due to the LKM induction above that which occur naturally.

Several studies have suggested that training in compassion and mindfulness can reduce emotional reactivity to laboratory based social stressors (Pace et al., 2009; Britton et al., 2012; Arch et al., 2014). The results of the current study show some consistency with this research in that participants in both groups showed an increase in distress following the MIST and then a decrease in distress during the stress recovery period. Post-induction affiliative affect increases in the current study are consistent with Arch et al.'s (2014) finding that participants receiving self-compassion training reported higher state self-compassion during the TSST recovery period. By contrast, the current study did not show that the self-compassion condition differentially reduced subjective distress, or increased adaptive physiological activity during the stress recovery period, as reported by the above studies.

Such inconsistencies may be explained by methodological differences. For example, the studies described above employ compassion/mindfulness *training* (i.e. therapeutic interventions or multiple meditation inductions) as opposed to a single induction. Therefore, participants in these studies had more opportunity to develop their coping strategies, and thus may have been more able to access the soothing system and engage in adaptive functioning. Indeed, previous studies have shown that the amount of practice people engage in impacts the effectiveness of compassion-focused and mindfulness interventions (Pace et al., 2009; Jazaieri, et al, 2013; Carmody & Baer, 2008). Furthermore, compassion training occurred before rather than after the administration of the social stressor. This may be advantageous as individuals can use the self-compassionate strategies developed during the training as they become necessary, i.e. during the social-stressor, as opposed to trying to make use of a new (albeit potentially helpful) strategy after the stress-inducing event. Such findings may have significant implications for the use of compassion focussed approaches in clinical settings as they may suggest that they have better utility as protective rather than reparatory interventions.

Experimental effects on self-referential processing

Behavioural data for the self-referential task demonstrated that both groups exhibited small changes in word preferences and reductions in latencies for trait adjectives in all construct categories. Notably, the LKM induction did not affect self-referential processing differentially to the neutral condition. Word preference changes between the stress condition (post-MIST) and the stress recovery condition (post-induction) were not completely consistent; while preference for adjectives in the Kindness category and Judgemental category moved in the expected direction

following the inductions (increased and decreased, respectively), preference for Common Humanity and Isolation adjectives did not.

The findings of the current study failed to replicate those reported by Kirschner (2016) who showed that a LKM induction increased preferences for positively valenced trait adjectives and decreased preferences for negatively valenced adjectives. One possible explanation for the current findings may concern the construct validity of the novel self-referential task, that is, the ability of the task to target the putative constructs of Self-Kindness, Common Humanity, Self-Judgement and Isolation. Although the internal consistency for the word categories was good ($>.80$), some of the correlations between adjective preferences and the corresponding SCS subscale score were in the small – medium range suggesting that the overlap between the self-referential task and a well validated measure of self-compassion was modest. Representing abstract concepts such as “common humanity” with single adjectives may not provide participants (with no familiarity of such concepts) with enough information to respond in the envisaged manner. There may be a case for the inclusion of short phrases or sentences such as “I experience a sense of togetherness” as opposed to the single word “togetherness” to improve the validity of the self-referential task. Furthermore, the potential effects of the self-compassion meditation could have been masked by reductions in response latencies due to the repetition effect incurred by using the same word list for post-MIST and post-induction administrations. It follows that future studies would benefit from using separate lists of adjectives for each condition.

The role of individual differences on affect and self-referential processing

Moderation models showed that participants in the LKM group with high FSCS self-criticism scores reported high state togetherness (Common Humanity index) following the stress recovery induction suggesting that self-critical individuals reported increased affiliative affect following the LKM. This finding is consistent with those reported by Kirschner (2016) who found that participants with low self-compassion and high self-criticism benefitted most from self-compassion meditations. By contrast, participants in the LKM group showed the opposite pattern in the self-referential task, i.e. those with high FSCS self-criticism scores exhibited higher preference for Isolation adjectives after the induction. Although this finding may at first seem paradoxical, it echoes the results of the main analysis in that participants in the LKM group reported increases in self-report state affiliative affect in the absence of physiological and self-referential changes. Such findings suggest that participants' self-report responses may be markedly different to their behavioural responses and physiological experience.

One possible explanation may be provided by the notion of *fear* of compassion. It has been recognised that self-critical individuals find it difficult to be compassionate towards themselves, and may even find self-compassion aversive (Gilbert, McEwan, Matos & Rivis, 2011). Moreover, people with social anxiety disorder have been shown to be fearful of both negative and positive evaluations (Werner et al., 2012). The MIST manipulation in the current study caused significant increases in both self-report levels of distress and sympathetic activity consistent with activation of the threat system (Gilbert, 2009, 2014). Thus, in the context of the MIST manipulation in the current study, the induced anxiety and accompanying activation of the threat-system may have caused an aversive reaction to the LKM

induction in individuals with high trait self-criticism. Such an explanation is consistent with the findings of Rockliff, Gilbert, McEwan Lightman and Glover (2008) who reported that HRV decreased (indicating *increased* threat processing) in highly self-critical individuals during a compassionate imagery exercise. Moreover, Kirschner (2016) found that individuals with recurrent depression and high self-criticism reported increased state affiliative affect but did not exhibit the accompanying adaptive physiology changes in response to a LKM induction. Concordantly, remitted depressive patients showed increased positive affiliative affect *and* accompanying physiological changes in response to LKM after the completion of a MBCT intervention.

Clinical and theoretical implications

The above findings have several clinical and theoretical implications. Firstly, the observed discrepancy between self-report measures and behavioural and physiological responses highlights the unreliable nature of self-report data, especially in settings where demand characteristics can play a role (e.g. non-blinded studies and therapeutic settings). Secondly, there was no evidence that the LKM differentially impacted affective or physiological stress recovery compared to the neutral condition. As such, it could be concluded that the LKM did not promote stress recovery above that which occurs naturally. This suggests that it may be difficult to *induce* a compassionate response and the associated activation of Gilbert's soothing system after a social-stressor, especially for individuals with high trait self-criticism. Taken together with previous studies investigating the impact of compassion-focused approaches on social stress reactivity (Pace et al., 2009; Britton et al., 2012; Arch et al., 2014), these findings suggest that compassion-focused approaches have greater potential to be efficacious when cultivated through longer-term training interventions.

However, there is another possible interpretation of the findings. Participants in *both* groups showed affective and physiological recovery from the social stressor. As such, it is possible that the LKM and neutral inductions supported stress recovery equally. The neutral supermarket induction employed in the current study was an active control condition designed to match the LKM, with exception of the self-compassionate content. However, the induction retained several qualities present in the LKM with respect to pace and tone of voice. Such sensory cues are thought to translate a sense of warmth and caring that is crucial to the embodiment of compassion and the activation of the soothing system (Wang, 2005; Gilbert & Proctor, 2006; Gilbert, 2009). Therefore, participants in the neutral condition may have benefitted from these sensory cues of compassion. Moreover, engaging in the supermarket scenario may have distracted participants from ruminating on their performance during the stress task, a process that is known to increase negative affect and sympathetic arousal (Watkins, Teasdale & Williams, 2000; Kirschner, 2016). As such, it is plausible that the neutral condition may, in fact, have provided participants with a mechanism to promote stress recovery.

Limitations and future directions

The current study tested the hypothesis that a compassion-focused intervention promotes recovery from social evaluative stress by comparing a self-compassion intervention with an active control condition. However, in order to delineate other potential factors influencing the recovery period, the study may have benefitted from the inclusion of additional experimental conditions. For example, the inclusion of a self-directed imagery condition may have allowed the impact of tone of voice to be dis-entangled from the “neutral” induction. Likewise, the inclusion of a condition with no induction would have allowed a direct comparison of recovery

during experimental manipulations to spontaneous stress recovery. However, it was not feasible to recruit a large enough sample size to examine all these experimental conditions with sufficient power within the constraints of study of this scale.

Another potential limitation to the current study concerns the degree to which self-compassion is a measurable psychological construct. “Self-compassion” represents multiple underlying psychological components (Neff 2003a, 2003b) with associated physiological underpinnings (Gilbert, 2009, 2014). Such a dynamic and multifaceted conceptualisation has been criticised in its ability to represent a unitary construct that is distinct from other related concepts (Williams, Dalgleish, Karl & Kuyken, 2014). However, self-compassion has been shown to be statistically discrete from concepts such as self-esteem and self-criticism (Neff, Rude & Kirkpatrick, 2007; Neff & Vonk, 2009). Moreover, recent research examining the validity of the SCS has suggested that an overall “self-compassion” factor remains an appropriate way to represent the construct in multiple populations (Neff, 2016). Within the current study, the triangulation approach adopted to measure putative psychological *and* physiological mechanisms ensured that the underlying constructs of self-compassion were adequately investigated.

Several further limitations were also identified. Baseline self-referential processing was not assessed so it was not possible to investigate whether the social-stress manipulation had an impact on self-referential processing. Nevertheless, the self-referential task demonstrated utility in revealing differences between self-report and self-referential data for the moderating effect of trait self-criticism. Future studies would benefit from developing different versions of self-referential tasks so that changes in self-referential processing between experimental manipulations can be more easily deduced. There was some evidence from the

current findings that people with high self-criticism reported more affiliative affect suggesting that self-compassion inductions may benefit more critical individuals. However, participants in the current study likely represented a high functioning and resilient sample. Thus, future studies would do well to investigate the impact of self-compassion interventions on social stress with participants who have difficulties with self-criticism and social anxiety. Moreover, the relationship between self-criticism and *fear of compassion* could be explicitly addressed in such paradigms. Finally, future studies investigating the stress recovery processes would benefit from investigating whether self-compassion meditations such as LKM are better utilised by participants who have engaged in previous compassion-focussed training/interventions.

Conclusion

The current study investigated the efficacy of a self-compassion induction to attenuate negative psychophysiological processing and promote recovery from social evaluative stress. Compared to a control induction, participants engaging in LKM reported increases in state affiliative affect, but the differences were not significant. Furthermore, no evidence was found for adaptive physiological activity or self-referential processing due to the LKM. Thus, the current study casts doubt on whether a single induction of a self-compassion meditation can differentially promote recovery from social stress. Self-report and self-referential data yielded contrasting results in terms of the moderating effect of trait self-criticism on responses to the self-compassion induction. Such findings draw into question the reliability of self-report data, and pose further questions regarding whether self-critical individuals benefit more or less from self-compassion interventions.

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Appendices

Appendix A. Email templates for non-eligible participants.



Dear,

You are receiving this e-mail because you recently participated in a research study, "stress and emotional processing" where you completed online questionnaires designed to investigate individual emotional responses. Thank you very much for your participation. Unfortunately you are unable to participate in the current study, however there is other research being carried out in the department which you may be suitable for in the future.

The reason I am contacting you again is because on one of the questionnaires, the depression severity measure, you scored above a particular threshold score, indicating that you may currently be experiencing a high level of symptoms of depression. The questionnaire does not unequivocally diagnose depression; instead it just gives an indication that you are currently experiencing a high number of thoughts and feelings which can be a sign of depression.

We understand that you may not be interested in receiving any information about depression or that you may already be managing or seeking help for your feelings or difficulties. Alternatively, what you reported in the questionnaires may have resolved itself since you completed the questionnaires, or the questionnaires may have exaggerated how distressed you were feeling (which can sometimes happen, especially during stressful time periods, since questionnaires only have limited response options). If any of the above is the case, please feel free to disregard this e-mail.

However, if you are experiencing these difficulties and not currently receiving help and feel you may benefit from some support for these feelings, or if you are simply interested in receiving some more information about depression, you may find the following information helpful.

First of all, there is a PDF document attached to this email that provides useful information on depression.

Second, if you are experiencing depression or suicidal thoughts, and you are currently not receiving any treatment, it is strongly recommended that you make an appointment with your GP to talk about how you are feeling and to consider treatment options. Your GP is there to support you and can either directly provide treatment (e.g., by prescribing medication, if that is appropriate and your choice), or can access other treatments (such as psychological therapy) for you.

Third, if you want immediate support or advice for any difficulties, we recommend you contact the following:

University of Exeter Wellbeing Service

Wellbeing Services have a specialist and experienced team of practitioners who can offer mental health advice and support. The service is available to students who experience a range of mental health difficulties with a specific emphasis on how your health is impacting on your ability to study and cope at University.

<http://www.exeter.ac.uk/wellbeing/>

Telephone 01392 724381

Samaritans

Samaritans provides confidential emotional support, 24 hours a day, for people who are experiencing feelings of distress or despair. Samaritans are there if you're worried about something, feel upset or confused, or just want to talk to someone.

Telephone (24 hours): 08457 90 90 90

E-mail: jo@samaritans.org

Website: <http://www.samaritans.org>

Address: Chris, P.O. Box 9090, Stirling, FK8 2SA

Depression Alliance

Depression Alliance is a charity which aims to assist people who are affected by depression. Depression Alliance offer information, a range of publications, self-help and support groups for people with depression.

Telephone (to request an information pack): 0845 123 23 20

E-mail: information@depressionalliance.org

Website: <http://www.depressionalliance.org>

Address: Depression Alliance, 20 Great Dover Street, London, SE1 4LX

SANeline

SANeline is a national out-of-hours telephone helpline, offering emotional support and information for people affected by mental health problems. They also offer e-mail support through SANemail, their e-mail service.

Telephone (6pm – 11pm, daily): 0845 767 8000

E-mail: visit <http://www.sane.org.uk/SANemail>

Website: <http://www.sane.org.uk/SANeline>

Address: 1st Floor Cityside House, 40 Adler Street, London E1 1EE

Other useful websites for information about depression:

NHS choices:

<http://www.nhs.uk/Conditions/Depression/Pages/Introduction.aspx>

Mind:

http://www.mind.org.uk/help/diagnoses_and_conditions/depression

Depression Alliance:

<http://www.depressionalliance.org/>

University of Exeter:

<http://www.exeter.ac.uk/mooddisorders/>

If you have any specific questions or concerns, please contact me at lp374@exeter.ac.uk, and I or my supervisor will provide further advice and guidance.

Kind regards,



Hello,

You are receiving this e-mail because you recently participated in a research study, where you completed a series of online questionnaires designed to investigate individual emotional responses. Thank you very much for filling in the screening questionnaires. Unfortunately you are not eligible to take part in the current study, however, there is other research being carried out in the department which you may be suitable for.

The reason I am contacting you again is because on some of the questionnaires, the life events measure and Post-Traumatic Stress Disorder (PTSD) screen, you indicated that you may have experienced (a) very stressful life event(s); i.e., psychological trauma, and/or (b) may currently be experiencing symptoms of PTSD. The questionnaire does not unequivocally diagnose PTSD; instead it just gives an indication that you are currently experiencing a number of symptoms which can be a sign of PTSD.

We understand that you may not be interested in receiving any information about PTSD or that you may already be managing or seeking help for your feelings or difficulties. Alternatively, what you reported in the questionnaires may have resolved itself since you completed the questionnaires, or the questionnaires may have exaggerated how distressed you were feeling (which can sometimes happen, especially during stressful time periods, since questionnaires only have limited response options). If any of the above is the case, please feel free to disregard this e-mail.

However, if you are experiencing these difficulties and not currently receiving help and feel you may benefit from some support for these feelings, or if you are simply interested in receiving some more information about PTSD, you may find the following information helpful:

- There is a PDF document attached to this email that provides useful information on PTSD.
- If you want immediate support or advice for any difficulties, we recommend you contact the following:

University of Exeter Wellbeing Service

Wellbeing Services have a specialist and experienced team of practitioners who can offer mental health advice and support. The service is available to students who experience a range of mental health difficulties with a specific emphasis on how your health is impacting on your ability to study and cope at University.

<http://www.exeter.ac.uk/wellbeing/>

Telephone 01392 724381

ASSIST

ASSIST is an organisation for people suffering from PTSD.

Telephone: 01788 560 800

Web: www.assisittraumacare.org.uk

Address: 11 Albert St, Rugby, CV21 2RX

SANeline

SANeline is a national out-of-hours telephone helpline, offering emotional support and information for people affected by mental health problems. They also offer e-mail support through SANemail, their e-mail service.

Telephone (6pm – 11pm, daily): 0845 767 8000

E-mail: visit <http://www.sane.org.uk/SANEmail>

Website: <http://www.sane.org.uk/SANeline>

Address: 1st Floor Cityside House, 40 Adler Street, London E1 1EE

Other useful websites for information about depression:

NHS choices:

<http://www.nhs.uk/Conditions/Depression/Pages/Introduction.aspx>

Mind:

http://www.mind.org.uk/help/diagnoses_and_conditions/depression

Depression Alliance:

<http://www.depressionalliance.org/>

University of Exeter:

<http://www.exeter.ac.uk/mooddisorders/>

If you are very worried or distressed about any of your symptoms or are experiencing depression, it is strongly recommended that you make an appointment with your GP to talk about how you are feeling and to consider treatment options. Your GP is there to support you and can either directly provide treatment (e.g., by prescribing medication, if that is appropriate and your choice), or can access other treatments (such as psychological therapy) for you.

If you have any specific questions or concerns, please contact me at lp374@exeter.ac.uk, and I or my supervisor will provide further advice and guidance.

Best wishes,



Hello,

You are receiving this e-mail because you recently participated in a research study, where you completed a series of online questionnaires designed to investigate individual differences in emotional responses. Thank you very much for your participation. Although you are unable to participate in the laboratory study, there is other research being carried out in the department which you may be suitable for in the future.

The reason I am contacting you again is because you indicated that you may have a history of, or currently be suffering from mental health difficulties.

We understand that you may not be interested in receiving any information about mental health or that you may already be managing or seeking help for your feelings or difficulties. Alternatively, what you reported may have resolved itself since you completed the questions, or the responses may have exaggerated how distressed you were feeling (which can sometimes happen, especially during stressful time periods. If any of the above is the case, please feel free to disregard this e-mail.

However, if you are experiencing these difficulties and not currently receiving help and feel you may benefit from some support for these feelings, or if you are simply interested in receiving some more information about depression, you may find the following information helpful.

First of all, there is a PDF document attached to this email that provides useful information on depression.

Second, if you are experiencing depression or suicidal thoughts, and you are currently not receiving any treatment, it is strongly recommended that you make an appointment with your GP to talk about how you are feeling and to consider treatment options. Your GP is there to support you and can either directly provide treatment (e.g., by prescribing medication, if that is appropriate and your choice), or can access other treatments (such as psychological therapy) for you.

Third, if you want immediate support or advice for any difficulties, we recommend you contact the following:

Samaritans

Samaritans provides confidential emotional support, 24 hours a day, for people who are experiencing feelings of distress or despair. Samaritans are there if you're worried about something, feel upset or confused, or just want to talk to someone.

Telephone (24 hours): 08457 90 90 90

E-mail: jo@samaritans.org

Website: <http://www.samaritans.org>

Address: Chris, P.O. Box 9090, Stirling, FK8 2SA

Depression Alliance

Depression Alliance is a charity which aims to assist people who are affected by depression. Depression Alliance offer information, a range of publications, self-help and support groups for people with depression.

Telephone (to request an information pack): 0845 123 23 20

E-mail: information@depressionalliance.org

Website: <http://www.depressionalliance.org>

Address: Depression Alliance, 20 Great Dover Street, London, SE1 4LX

SANeline

SANeline is a national out-of-hours telephone helpline, offering emotional support and information for people affected by mental health problems. They also offer e-mail support through SANemail, their e-mail service.

Telephone (6pm – 11pm, daily): 0845 767 8000

E-mail: visit <http://www.sane.org.uk/SANEmail>

Website: <http://www.sane.org.uk/SANeline>

Address: 1st Floor Cityside House, 40 Adler Street, London E1 1EE

Other useful websites for information about depression:

NHS choices:

<http://www.nhs.uk/Conditions/Depression/Pages/Introduction.aspx>

Mind:

http://www.mind.org.uk/help/diagnoses_and_conditions/depression

Depression Alliance:

<http://www.depressionalliance.org/>

University of Exeter:

<http://www.exeter.ac.uk/mooddisorders/>

If you have any specific questions or concerns, please contact me at lp374@exeter.ac.uk, and I or my supervisor will provide further advice and guidance.

Kind regards,

Appendix B. Participant information sheet, consent form, and debriefing sheet.

PARTICIPANT INFORMATION SHEET

Title: Stress and emotional processing.

Principal Researcher: Lewis Pettit

Supervisors: Dr Anke Karl, Professor Ed Watkins.

You are being invited to take part in a study which aims to investigate the relationship between stress, emotional processing, and body responses. Before you decide whether you would like to take part, please read through the following information which will clarify why the study is being conducted, and what your involvement would be.

What is the purpose of the study?

The purpose of this study is to investigate the relationship between stress, emotional processing, and body responses. The findings could hopefully help us to understand how individuals cope with stress and how we can facilitate wellbeing. The study will form the basis of a Doctorate of Clinical Psychology thesis being undertaken by the Principal Researcher (Lewis Pettit, see contact details below, page 2).

Am I required to take part?

It is entirely up to you if you wish to take part. If you do decide to take part, you are free to change your mind at any time and can withdraw during the study by letting the Principle Researcher know. If you decide not to take part after you have started the study, any data collected will no longer be included in the results of the study and will instead be destroyed.

What does participation involve?

If you think that you would like to take part in the study, the Principal Researcher can contact you by telephone or email to discuss the study in more detail, and to answer any questions you may have. Alternatively, you can contact the Principle Researcher – see page 2).

In order to take part in this study you will be asked to complete a screening questionnaire that will be sent to you by email. ***If you are currently experiencing excessive levels of distress in your daily life or if you have a history of psychological trauma or posttraumatic stress disorder we advise you not to participate in this research.*** Individuals who fulfil the inclusion criteria will then be invited to participate in a laboratory session which lasts approximately 1 hour and includes several tasks during which we will measure your heart rate and the sweat response. For this, we will clean your skin with alcohol and place leads on your chest and fingers which we fill with a salty gel that can be easily wiped off. After we have set this up you will be asked to complete a number of different computer tasks, some of them you may perceive as challenging or temporarily stressful, some of them you may find interesting or somewhat boring. The precise instructions will be given on the day.

Expenses and payments:

There is no payment for taking part in this study, however you will be entered into a draw to win £150 of Amazon vouchers. If you are a Psychology student at the University of Exeter, you will also be awarded 1.5 course credits. If you are not eligible to take part in the laboratory session you can claim 0.5 credits for filling out the screening questionnaire.

Are there disadvantages of taking part in this study?

There are no known disadvantages associated with taking part in the study. The measurement of bodily responses will be done using safe and well-established procedures; the leads can be removed in less than a minute and the gel can be easily wiped and/or washed off. Some of the computer tasks may be challenging and can temporarily lead to mild to moderate distress usually lasting no longer than a few

minutes. In the unlikely event that you experience the tasks as extremely unpleasant we will stop the testing. You may enjoy some of the tasks you may find others boring. All experimental and physiological recording procedures and have been safely and widely used in research.

What if there is a problem?

If you wish to complain, or have any concerns about any aspect of the way you have been approached or treated during the course of this study, you can contact the Study Supervisor, Dr Anke Karl (contact details on page 3).

What are the possible advantages of taking part?

There are no direct advantages for you. However, the findings of this study will help us to understand how stress, emotional processing, and body responses are related. This may help us understand how individuals cope with stress and how we can facilitate wellbeing. If you decide to take part, we hope that you will find the experience interesting and enjoyable.

Will my taking part in the study be kept confidential?

All information which is collected from you during the research would be kept strictly confidential within the limits of the law. You will be allocated your own unique study code number, ensuring that all information that you give will contain your number rather than your actual name. Identifiable information will be stored in a locked cabinet and only the researchers of this project will have access to it. In accordance with British Psychological Society research guidelines, all data for the study will be securely stored for 20 years and will be destroyed after this time.

What will happen with the results?

It is planned that the results will be written up in order to inform clinicians and researchers who are interested in mood disorders. Any write-up of the findings for this study will not mention you personally. If you would like to obtain a copy of the findings, we will be more than happy to send them to you when they become available.

Who has reviewed this study?

This study has been reviewed and approved by the School of Psychology Ethics Committee, University of Exeter.

Contact details

If you require further information or would like to ask any questions, please do not hesitate to contact the Principal Researcher using the details below.

Principal Researcher:

Lewis Pettit
Clinical Psychology Doctoral Program
Washington Singer Laboratories
Perry Road
Exeter, EX4 4QG
Tel: 07709 575 779
Email: lp374@exeter.ac.uk

Supervisors:

Professor Ed Watkins
Mood Disorders Centre
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG
Tel: 01392 724692
Email: E.R.Watkins@exeter.ac.uk

Dr Anke Karl
Mood Disorders Centre
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG
Tel: 01392 725271
Email: A.Karl@exeter.ac.uk

PARTICIPANT CONSENT FORM

Title: Stress and emotional processing.

Researcher:

Lewis Pettit
Clinical Psychology Doctoral Program
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

lp374@exeter.ac.uk

Supervisors:

Dr Anke Karl & Professor Ed Watkins
Mood Disorders Centre
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

A.Karl@exeter.ac.uk

E.R.Watkins@exeter.ac.uk

***Please read
statement and
initial box***

- 1) I confirm that I have read and understood the Information Sheet for the above study. I have had the opportunity to consider the information and ask questions, and have had these answered satisfactorily. ☐
- 2) I am aware that my participation is voluntary and that I can withdraw my consent at any point during the study without giving any reason, and without my legal rights or medical care being affected. ☐
- 3) I understand that I have the right to obtain information about the findings of the study after it is completed. ☐
- 4) I understand that sections of the data collected during the study may be looked at by relevant individuals of the University of Exeter (i.e. the research Supervisors) and from regulatory authorities, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my data. ☐
- 5) I agree to take part in the above study. ☐
- 6) I would like my name and contact details to be kept on a secure and confidential database so that I can be contacted about taking part in other research studies within the Mood Disorders Centre. ☐

Name of participant (print)

Date:

Signature

Name of researcher (print)

Date:

Signature

One copy for participant, one copy for researcher

DEBRIEFING FORM

Title: Stress and emotional processing (self-compassion).

Principal Researcher: Lewis Pettit

Supervisors: Dr Anke Karl, Professor Ed Watkins

Thank you for participating in this study – your time and effort is very much appreciated!

You have taken part in a study which investigates the psychological and physiological effects of self-compassion on socially stressful situations.

“Self-compassion” involves being kind to ourselves and not judging ourselves when we experience misfortune and personal failings. It involves an acceptance that such experiences will occur and that it is okay for them to occur, and an acknowledgment that we are not alone in experiencing them.

Purpose of the study:

The current study aimed to investigate whether self-compassion could reduce the psychological and physiological effects of socially stressful experiences. The findings could help understand the processes and mechanisms that prevent mental health problems such as anxiety and depression, and facilitate wellbeing.

Negative experiences of social situations in which people feel judged (social evaluations) are thought to induce strong negative self-evaluations and self-critical thinking. Indeed, evidence shows that negative social evaluations and rejections are amongst the most important factors contributing to self-criticism and low self-esteem and commonly precede depressive episodes. Furthermore, the threat or prediction of negative social evaluations are thought to play a major role in social anxiety.

The non-judgemental and accepting attitude fostered by self-compassion may be an effective strategy to alleviate distress at times when we feel judged, or judge ourselves, in social situations. Research shows that people with high levels of self-compassion experience less psychological distress to negative life events. In addition, they show less physiological stress responses as measured by heart rate and skin conductance. Moreover, research studies have shown that training participants in self-compassion reduces their experience of distress in stressful social situations, suggesting that self-compassion can be protective in these contexts. However, the underlying mechanisms by which this is achieved remain unknown.

Findings from this study will help us to build up a better picture of how self-compassion works, and how it can support wellbeing and prevent mental health problems. This is important since self-compassion is a relatively new concept in psychology research and its psychological and physiological processes are not well understood.

The social stress task:

As part of the study you took part in the Montreal Imaging Stress Test (MIST) which has been designed to induce social stress in participants. One way the test achieves this is to provide **false** information about participants' performance – you were shown a graph and received feedback which suggested that you were performing badly in the test, and worse than other participants. This information was **not accurate** and was included to increase your stress response. In fact, your performance in the MIST task **was not compared** to any other participants' performance.

Groups:

You will have been allocated to either the “self-compassion” group who received the Loving Kindness Meditation, or the “neutral” group who received the Supermarket Induction. Due to the hypothesised benefits of self-compassion on social stress, if you were in the “neutral” group you will be asked if you would like to listen to the Loving Kindness Meditation before you leave.

If you feel low or anxious:

All the procedures used in the study have been shown to be safe and are widely used in research studies to induce temporary stress which usually fades within few minutes. However, in the unlikely event that you continue to feel distressed, anxious, or experience low mood, please inform the principal researcher and/or contact the University of Exeter wellbeing service, your G.P., or one of the following helplines:

Samaritans: 116 123

MIND: 0300 123 3393

SANE: 0300 304 7000

University of Exeter Wellbeing Service: 01392 724381

Contact Details:

If you have any further questions, or you would like your data to be removed from the study, please do not hesitate to contact either the Principal Researcher, or the chair of the University of Exeter Psychology Research Ethics Committee (REC) using the details below.

Principal Researcher:

Lewis Pettit
Doctorate in Clinical Psychology programme
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

Email: lp374@exeter.ac.uk

University of Exeter REC chair:

Dr. Lisa Leaver
University of Exeter
Washington Singer Laboratories
Perry Road
Exeter
EX4 4QG

Email: L.A.Leaver@exeter.ac.uk

Appendix C. Ethical approval documentation.

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Psychology on line Ethics approval system - Lewis Pettit

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Your applications

2016/1245 (rev2)	Dr. Lewis Pettit, Dr. Anke Karl, Prof. Ed Watkins	The effect of self-compassion on negative self-referential processing and its psychophysiological correlates following a social evaluative threat.	conditional acceptance	11/05/2016	Track B
2016/1147	Dr. Lewis Pettit, Dr. Anke Karl, Prof. Ed Watkins	The effect of self-compassion on negative self-referential processing and its psychophysiological correlates following a social evaluative threat.	referred-archive	19/04/2016	Track B

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Psychology on line Ethics approval system - Lewis Pettit

This Application has been marked as accepted, so no further edits can be made.

DETAILS

Summary | Consent | Psychology | Groups | Animals | Track B | Attachments

Project details

Conditions of acceptance

none

® Title of Project (max 25 words)

The effect of self-compassion on negative self-referential processing and its psychophysiological correlates following a

® Type of Project

Study not requiring approval by NHS NRES

® Names of researchers

Dr. Lewis Pettit, Dr. Anke Karl, Prof. Ed Watkins

® Correspondent's Email (separate with a semi-colon if providing more than one)

lp374@exeter.ac.uk;A.Karl@exeter.ac.uk

Estimated start date (dd/mm/yyyy) and duration of the project

01/04/2016

Reviewer Comments

This seems very thorough, except for one aspect. The social stress task involves bogus performance norms, so there is an omission in the study. It is not clear how participants will be debriefed of this, and it is not mentioned in the debriefing. I would suggest that the researcher take care to orally explain the deception at the end of the procedure, and this should be backed up by statements in the written debriefing. Please provide information about how this will be handled.

NM

Appendix D. Screening measures.**PHQ-9 Depression**

**Over the last 2 weeks, how often have you
been bothered by any of the following problems?**

(Use “✓” to indicate your answer”

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things.....	0	1	2	3
2. Feeling down, depressed, or hopeless.....	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much.....	0	1	2	3
4. Feeling tired or having little energy.....	0	1	2	3
5. Poor appetite or overeating.....	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down.....	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television.....	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual.....	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way.....	0	1	2	3

Column totals ____ + ____ + ____ + ____

= Total Score ____

From the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ). The PHQ was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues. For research information, contact Dr. Spitzer at rls8@columbia.edu. PRIME-MD® is a trademark of Pfizer Inc. Copyright© 1999 Pfizer Inc. All rights reserved. Reproduced with permission

Primary Care PTSD Screen

In your life, have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month, you*

1. Have had nightmares about it or thought about it when you did not want to?

YES

NO

2. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it?

YES

NO

3. Were constantly on guard, watchful, or easily startled?

YES

NO

4. Felt numb or detached from others, activities, or your surroundings?

YES

NO

Current research suggests that the results of the PC-PTSD should be considered "positive" if a patient answers "yes" to any three items.

A positive response to the screen does not necessarily indicate that a patient has Posttraumatic Stress Disorder. However, a positive response does indicate that a patient *may* have PTSD or trauma-related problems and further investigation of trauma symptoms by a mental-health professional may be warranted.

If the PC-PTSD screening instrument is utilized, clarify responses to determine:

a. Whether the patient has had a traumatic experience

"I notice from your answers to our questionnaire that you experience some symptoms of stress. At some point in their lives, many people have experienced extremely distressing events such as combat, physical or sexual assault, or a bad accident, and sometimes those events lead to the kinds of symptoms you have. Have you ever had any experiences like that?"

<http://www.ncptsd.va.gov>

Self Compassion Scale (SCS)

- _____ 1. I'm disapproving and judgmental about my own flaws and inadequacies.
- _____ 2. When I'm feeling down I tend to obsess and fixate on everything that's wrong.
- _____ 3. When things are going badly for me, I see the difficulties as part of life that everyone goes through.
- _____ 4. When I think about my inadequacies, it tends to make me feel more separate and cut off from the rest of the world.
- _____ 5. I try to be loving towards myself when I'm feeling emotional pain.
- _____ 6. When I fail at something important to me I become consumed by feelings of inadequacy.
- _____ 7. When I'm down and out, I remind myself that there are lots of other people in the world feeling like I am.
- _____ 8. When times are really difficult, I tend to be tough on myself.
- _____ 9. When something upsets me I try to keep my emotions in balance.
- _____ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.
- _____ 11. I'm intolerant and impatient towards those aspects of my personality I don't like.
- _____ 12. When I'm going through a very hard time, I give myself the caring and tenderness I need.
- _____ 13. When I'm feeling down, I tend to feel like most other people are probably happier than I am.
- _____ 14. When something painful happens I try to take a balanced view of the situation.
- _____ 15. I try to see my failings as part of the human condition.
- _____ 16. When I see aspects of myself that I don't like, I get down on myself.
- _____ 17. When I fail at something important to me I try to keep things in perspective.
- _____ 18. When I'm really struggling, I tend to feel like other people must be having an easier time of it.
- _____ 19. I'm kind to myself when I'm experiencing suffering.
- _____ 20. When something upsets me I get carried away with my feelings.
- _____ 21. I can be a bit cold-hearted towards myself when I'm experiencing suffering.
- _____ 22. When I'm feeling down I try to approach my feelings with curiosity and openness.
- _____ 23. I'm tolerant of my own flaws and inadequacies.
- _____ 24. When something painful happens I tend to blow the incident out of proportion.
- _____ 25. When I fail at something that's important to me, I tend to feel alone in my failure.
- _____ 26. I try to be understanding and patient towards those aspects of my personality I don't like.

Functions of Self-Criticism/Self-Attacking Scale (FSCS)



THE
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THE FUNCTIONS OF SELF-CRITICIZING/ATTACKING SCALE (FSCS)

There can be many reasons why people become critical and angry with themselves. Read each statement carefully and circle the number that best describes how much each statement is true for you.

Use the scale below.

Not at all like me 0	A little bit like me 1	Moderately like me 2	Quite a bit like me 3	Extremely like me 4
----------------------------	------------------------------	----------------------------	-----------------------------	---------------------------

I get critical and angry with myself:

- | | | | | | |
|--|---|---|---|---|---|
| 1. To make sure I keep up my standards. | 0 | 1 | 2 | 3 | 4 |
| 2. To stop myself being happy. | 0 | 1 | 2 | 3 | 4 |
| 3. To show I care about my mistakes. | 0 | 1 | 2 | 3 | 4 |
| 4. Because, if I punish myself I feel better. | 0 | 1 | 2 | 3 | 4 |
| 5. To stop me being lazy. | 0 | 1 | 2 | 3 | 4 |
| 6. To harm part of myself. | 0 | 1 | 2 | 3 | 4 |
| 7. To keep myself in check. | 0 | 1 | 2 | 3 | 4 |
| 8. To punish myself for my mistakes. | 0 | 1 | 2 | 3 | 4 |
| 9. To cope with feelings of disgust with myself. | 0 | 1 | 2 | 3 | 4 |
| 10. To take revenge on part of myself. | 0 | 1 | 2 | 3 | 4 |
| 11. To stop me getting overconfident. | 0 | 1 | 2 | 3 | 4 |
| 12. To stop me being angry with others | 0 | 1 | 2 | 3 | 4 |
| 13. To destroy a part of me. | 0 | 1 | 2 | 3 | 4 |
| 14. To make me concentrate. | 0 | 1 | 2 | 3 | 4 |
| 15. To gain reassurance from others. | 0 | 1 | 2 | 3 | 4 |
| 16. To stop me becoming arrogant. | 0 | 1 | 2 | 3 | 4 |
| 17. To prevent future embarrassments. | 0 | 1 | 2 | 3 | 4 |
| 18. To remind me of my past failures | 0 | 1 | 2 | 3 | 4 |
| 19. To keep me from making minor mistakes. | 0 | 1 | 2 | 3 | 4 |
| 20. To remind me of my responsibilities. | 0 | 1 | 2 | 3 | 4 |
| 21. To get at the things I hate in myself. | 0 | 1 | 2 | 3 | 4 |

Perceived Stress Scale (PSS)

Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name _____ Date _____

Age _____ Gender (Circle): **M** **F** Other _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

- | | | | | | |
|--|---|---|---|---|---|
| 1. In the last month, how often have you been upset because of something that happened unexpectedly? | 0 | 1 | 2 | 3 | 4 |
| 2. In the last month, how often have you felt that you were unable to control the important things in your life? | 0 | 1 | 2 | 3 | 4 |
| 3. In the last month, how often have you felt nervous and "stressed"? | 0 | 1 | 2 | 3 | 4 |
| 4. In the last month, how often have you felt confident about your ability to handle your personal problems? | 0 | 1 | 2 | 3 | 4 |
| 5. In the last month, how often have you felt that things were going your way? | 0 | 1 | 2 | 3 | 4 |
| 6. In the last month, how often have you found that you could not cope with all the things that you had to do? | 0 | 1 | 2 | 3 | 4 |
| 7. In the last month, how often have you been able to control irritations in your life? | 0 | 1 | 2 | 3 | 4 |
| 8. In the last month, how often have you felt that you were on top of things? .. | 0 | 1 | 2 | 3 | 4 |
| 9. In the last month, how often have you been angered because of things that were outside of your control? | 0 | 1 | 2 | 3 | 4 |
| 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them? | 0 | 1 | 2 | 3 | 4 |

Please feel free to use the *Perceived Stress Scale* for your research.

Mind Garden, Inc.

info@mindgarden.com

www.mindgarden.com

References

The PSS Scale is reprinted with permission of the American Sociological Association, from Cohen, S., Kamarck, T., and Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24, 386-396.
Cohen, S. and Williamson, G. Perceived Stress in a Probability Sample of the United States. Spacapan, S. and Oskamp, S. (Eds.) *The Social Psychology of Health*. Newbury Park, CA: Sage, 1988.

Appendix F. Script for Loving Kindness Meditation**Script for Loving Kindness Meditation clip (in the style of Loving-Kindness for Beginners (Neff))**

Sit in a comfortable position, reasonably upright and relaxed. (Pause) Close your eyes fully or partly. (Pause) You will now be guided through a few minutes exercise.

Bring to mind a person with whom you have a positive relationship, someone who you feel naturally warmly towards. This could be a child, a grandparent, a former teacher or mentor your cat or dog - whoever naturally brings happiness to your heart. Allowing yourself to feel what it's like to be in that being's presence (pause for 2 sec).

(Pause)

Holding this person in mind now extending best wishes towards them. Repeat softly with this person in mind:

May you be safe.

May you be peaceful.

May you be healthy.

May you live with ease.

(Pause)

May you be safe.

May you be peaceful.

May you be healthy.

May you live with ease.

(Pause)

When you notice that your mind has wandered, return to the words and the image of the loved one you have in mind. Savour any warm feelings that may arise. Go slow.

(Pause)

Now add yourself to your circle of good will. Put your hand over your heart and feel the warmth and gentle pressure of your hand (for just a moment or for the rest of the exercise), saying:

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

(Pause)

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

(Pause)

Holding your body in awareness, notice any stress or uneasiness that may be lingering within you, and offer kindness to yourself.

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease.

Repeat the phrases inwardly with enough space between them so that they are pleasing you. As best you can, gather all your attention behind one phrase at a time. (Pause)

If you find your attention wandering, don't worry, that's what minds do. You can simply let go of distractions and begin from here you are.

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease. (Pause)

Feelings, thoughts, or memories may come and go; allow them to arise and pass away. Let the anchor be the repetition of these phrases:

May I be safe.

May I be peaceful.

May I be healthy.

May I live with ease. (Pause)

Just rest and sit quietly in your own body, savouring the good will and compassion that flows naturally from your own heart. Know that you can return to the phrases anytime you wish.

(Pause for 15 sec)

(Pause, then end) Now, in your own time, slowly open eyes. The exercise is over.

Appendix G. Script for Neutral Supermarket Induction**Script for Neutral condition supermarket scenario**

Sit in a comfortable position, reasonably upright and relaxed. (Pause) Close your eyes fully or partly. (Pause) You will now be guided through a few minutes exercise.

We would like you to think about a normal or routine supermarket scenario. Try to think of a particular time that you visit a supermarket to do a large or weekly shopping. (Pause)

Think about arriving at the supermarket (Pause for 2 sec). What time in the day is it (Pause).

Is it in the late morning or early afternoon? How does the supermarket look like? (Pause for 2 sec)

Think about why you are at the supermarket. (Pause)

How does it feels like being at the supermarket (Pause)

Try to feel the weather of that day. Is it could or warm? (Pause)

Feel the temperature (Pause)

Do you have plenty of time to do the shopping or are you in a rush (Pause)?

You may select a trolley to store your items or a shopping basket? (Pause for 3 sec)

See if it's possible to think about what the trolley or shopping basket looks like. (Pause for 3 sec)

Feel the texture of the trolley or the shopping basket (Pause)

Now think about entering the shop (Pause for 3 sec).

Try to remember if you noticed anything special? (Pause for 3 sec)

Is the shop quiet and empty or is it crowded? (Pause)

Do you hear or see anything special (Pause for 3 sec) maybe a special offer (Pause for 3 sec).

What sounds do you hear? (Pause)

And now try to imagine which goods you come across first (Pause for 3 sec)

Think about walking down the first aisle (Pause for 3 sec).

Are there particular items you are looking for (Pause for 3 sec).

Play back what you were thinking in the situation. (Pause)

Now think about putting the items you need to buy into your trolley or shopping basket. (Pause for 3 sec)

Think about going through the shop aisle by aisle ... (Pause for 8 sec)

.....see if it is possible to imagine the shopping as much detailed as possible (Pause for 5sec).

You might come across the fruit and vegetable section (Pause).

Is there any particular smell that you notice (Pause)try to focus on them (Pause)

Do you have problems to reach an item? (Pause for 3 sec)

Do you have to reach up to a top shelf? (Pause for 3 sec)

Do you have to weight an item (Pause for 3 sec)

Try to feel the items (Pause)

Do you notice something special (Pause for 3 sec)or do you hear something special (Pause for 3 sec)

And now, think about going to the check-out/till to pay (Pause for 3 sec).

Think about putting your items out of the trolley or shopping basket (Pause for 3 sec).

Think about paying your purchases (Pause for 3 sec).

Are you paying by card or cash? (Pause for 3 sec)

Do you get some cash back (Pause for 3 sec).

Now think about putting your purchases back in the trolley or did you use a bag to carry them home? (Pause for 3 sec)

Think about taking your purchases home (Pause for 3 sec)

(Pause, then end) Now, in your own time, slowly open eyes. The exercise is over.

Appendix H. Visual Analogue Scales***Right now:*****0-----100****I don't feel compassionate
towards myself at all****I feel very compassionate
towards myself****0-----100****I feel like not being kind
and understanding
towards myself at all****I feel like being very kind and
understanding towards myself****0-----100****I am not tolerant of my
flaws and inadequacies at
all****I am very tolerant of my
flaws and inadequacies****0-----100****I don't feel a sense of
togetherness with others
at all****I very much feel a sense of
togetherness with others****0-----100****I don't feel at all self-
critical****I feel very self-critical****0-----100****I am not feeling
anxious/distressed at all****I feel very
anxious/distressed**

Appendix I. Self-referential task validation study summary and adjective list.*Summary of pilot study:*

Aims: To investigate the utility of a novel self-referential task to detect changes in participant experience of self-kindness, self-judgement, common humanity, and isolation facets of self-compassion following a Loving Kindness Meditation.

Method: Fifty-eight undergraduate students ranging between 18 – 23 years old were recruited for the study. Inclusion criteria was that participants were native English speakers and were not currently suffering from depression (below criteria for moderate to severe on PHQ-9). The study employed a repeated measures design in which participants completed an established self-report measure of self-compassion (SCS) as well as the novel self-referential task (as described in the Method section) at two timepoints; once before listening to the Loving Kindness Meditation (T1), and once after (T2). Correlational analyses were conducted to investigate the relationship between adjective preferences (“Me” allocations) for each facet of self-compassion, and the corresponding subscale of the SCS. Cronbach’s alpha analyses were conducted to assess the internal consistency of the adjectives within each subscale of self-referential task.

Results: Significant correlations were found between scores on the SCS and adjective preferences for the facets of self-judgement and isolation, but not self-kindness or common humanity (see Table I-1). The self-referential task demonstrated adequate internal consistency ($\alpha > 0.7$) on all facets of self-compassion for at least one timepoint (see Table I-2).

Table I-1.

Correlations Between Total Number of 'Me' Allocations and Total Score on the SCS for Each Subscale

SCS Score		Average 'Me' Allocations			
		SK	SJ	CH	I
SK	Coefficient	.109			
	Significance	.487			
SJ	Coefficient		-.612**		
	Significance		.000		
CH	Coefficient			.286	
	Significance			.063	
I	Coefficient				.346*
	Significance				.023

Note. SK = self-kindness, SJ = self-judgement, CH = common humanity and I = isolation. * = $p \leq 0.05$, ** = $p \leq 0.01$.

Table I-2.

Cronbach's Alpha for Overall Self-compassion and each Subscale

Subscale	Time Point		
	T1 + T2	T1	T2
Self-compassion	.912	.934	.928
SK	.604	.726	.425
SJ	.716	.683	.790
CH	.778	.813	.799
I	.729	.662	.774

Note. SK = self-kindness, SJ = self-judgement, CH = common humanity and I = isolation. T1 = time point one and T2 = time point two.

Self-referential task adjective list:

Self-Kindness	Self-Judgement	Common Humanity	Isolation
Capable	Harsh	Accepted	Abandoned
Compassionate	Hostile	Affiliated	Alone
Competent	Ignorant	Belong	Apart
Considerate	Immature	Bonded	Confined
Courageous	Incapable	Cohesive	Deserted
Dependable	Incompetent	Collaborative	Detached
Friendly	Inept	Collectivist	Disconnected
Generous	Insecure	Communal	Estranged
Good-natured	Intolerant	Connected	Excluded
Helpful	Judgmental	Cooperative	Exiled
Honest	Naïve	Included	Individualistic
Kind	Negative	Incorporated	Isolated
Loving	Overcritical	Integrated	Lonely
Pleasant	Self-critical	Involved	Reclusive
Reliable	Selfish	Loved	Rejected
Sincere	Stupid	Sharing	Secluded
Thoughtful	Thoughtless	Sociable	Segregated
Truthful	Unkind	Trusting	Solitary
Understanding	Unreliable	Unified	Stranded
Wise	Weak	United	Unconnected

Appendix J. Physiology Data Pre-Processing

HR determination in beats per minute was based on a semi-automatic R-wave detection algorithm implemented in the software AcqKnowledge (Version 4.2., BIOPAC Systems Inc., Goleta, CA). Raw ECG data were filtered applying a FIR bandpass filter between 0.5 and 35 Hz and 8000 coefficients. Artefact detection (i.e., noisy, missing or ectopic beats) and removal was performed using a template correlation and interpolation from the adjacent R-peaks based on Berntson and colleagues (Berntson, Quigley, Jang, & Boysen, 1990; Berntson & Stowell, 1998) and Solem, Laguna, and Sornmo (2006). The interpolation procedure was used for less than 5% of the ECG data. Mean HR in beats per minute was then extracted from the R-waves for each data section.

HRV determined from the artefact-free ECG (see above) by calculating a time series from the R-peaks and submitting it to a fast Fourier transformation that calculates the power spectrum of the R-R interval variation in a given time window (Berntson et al., 1997; Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology, 1996). Of particular interest was the frequency range between 0.15 Hz and 0.4 Hz (high frequency, HF). This high frequency band of HRV is generally considered a marker of parasympathetic input. Mean HF HRV were then extracted for each data section similar to the heart rate. HRV values were log-transformed using the natural log to normalise data.

SC was recorded from bipolar Ag/AgCl reusable strap electrodes on the medial phalanx of the middle and ring finger of the non-dominant hand, at a sampling rate of 125Hz. No filters were run on SC data; however the data was manually

screened for recording or movement artefacts, of which none were found within data portions of interest. Mean SCL, Maximum SCL values and minimum SCL values were extracted for the same time windows and a range correction (Lykken, Rose, Luther, & Maley, 1966) was applied to each data section for each participant to give a mean SCL corrected for individual differences. The formula for this was: Corrected SCL = (SCLmean – SCL min) / (SCL max-SCL min).

Appendix K. Dissemination plan

The findings of the current study will be disseminated in the following ways:

1. In the form of a presentation to trainee clinical psychologists, and staff from the Exeter DClinPsy programme (June 2017).
2. In the form of a peer-reviewed journal article to be prepared and submitted to Behaviour Research and Therapy (October 2017). Instructions to authors attached below.

Author information pack: Behaviour Research and Therapy.



BEHAVIOUR RESEARCH AND THERAPY

AUTHOR INFORMATION PACK

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An International Multi-Disciplinary Journal

The major focus of *Behaviour Research and Therapy* is an experimental psychopathology approach to understanding emotional and behavioral disorders and their prevention and treatment, using cognitive, behavioral, and psychophysiological (including neural) methods and models. This includes laboratory-based experimental studies with healthy, at risk and subclinical individuals that inform clinical application as well as studies with clinically severe samples. The following types of submissions are encouraged: theoretical reviews of mechanisms that contribute to psychopathology and that offer new treatment targets; tests of novel, mechanistically focused psychological interventions, especially

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GUIDE FOR AUTHORS

INTRODUCTION

The major focus of *Behaviour Research and Therapy* is an experimental psychopathology approach to understanding emotional and behavioral disorders and their prevention and treatment, using cognitive, behavioral, and psychophysiological (including neural) methods and models. This includes laboratory-based experimental studies with healthy, at risk and subclinical individuals that inform clinical application as well as studies with clinically severe samples. The following types of submissions are encouraged: theoretical reviews of mechanisms that contribute to psychopathology and that offer new treatment targets; tests of novel, mechanistically focused psychological interventions, especially ones that include theory-driven or experimentally-derived predictors, moderators and mediators; and innovations in dissemination and implementation of evidence-based practices into clinical practice in psychology and associated fields, especially those that target underlying mechanisms or focus on novel approaches to treatment delivery. In addition to traditional psychological disorders, the scope of the journal includes behavioural medicine (e.g., chronic pain). The journal will not consider manuscripts dealing primarily with measurement, psychometric analyses, and personality assessment.

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